

GE

UNIVERSITY
PENNSYLVANIA
LIBRARIES



INTERPRETATION PROGRAM FOR THE VAN WYCK LEFFERTS TIDE MILL

Michal Kucik

A THESIS

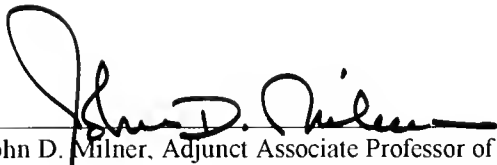
in

Historic Preservation

Presented to the Faculties of the University of Pennsylvania in
Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

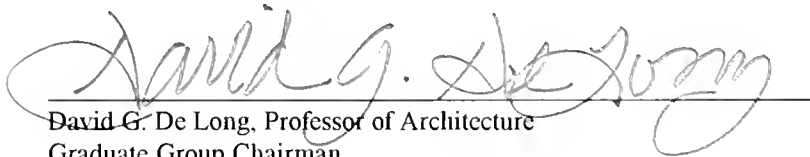
1994



John D. Milner, Adjunct Associate Professor of Architecture, Advisor



Christa Wilmanns-Wells, Lecturer in Historic Preservation, Reader



David G. De Long, Professor of Architecture
Graduate Group Chairman

UNIVERSITY
OF
PENNSYLVANIA
LIBRARIES

To my husband, Raz, that made it all possible...

Table of Content

Figures	vi
Drawings	viii
Acknowledgments	ix

CHAPTERS

1. Introduction	1
2. History of Milling.....	4
Early History	4
Milling in America and Later History of Milling.....	8
Windmills	9
Water Mills	10
Millstones.....	15
Tide Mills.....	16
Oliver Evans and the Automatic Mill	17
3. Long Island And Its Milling Industry.....	26
History and Other Facts.....	26
Surviving Water Operated Mills on Long Island	28
Nassau County	29
Saddle Rock Grist Mill	30
Roslyn Grist Mill	34
Suffolk County.....	36
Stony Brook.....	37
The New Mill in Blydenburgh Park.....	43
The mill on the Connetquot River	45
4. The Van Wyck Lefferts Tide Mill.....	47
History	47
First Period: End of 18 th Century to the End of the 19 th Century	48
Second Period - End of 19 th Century to the Second Half of the 20 th Century	51
Third Period From the Late 20 th Century Onward	52
Site and Structure.....	53
The Site.....	53
The Structure	53
Machinery	57
Deterioration.....	64
Foundations and Structural Problems.....	65
Exterior.....	66

Interior	68
5. Alternatives For Interpretation	70
Preliminary Problems and Basic Facts	70
The Options For the Interpretation of the Site	73
Off Site Programs - General	73
On Site Programs - General	73
Off Site Programs - Details	74
1. Relocation and Full Interpretation Program	74
2. Full Documentation And Relocating the Machinery	74
On Site Programs - Details	75
3. Repairing, Stabilizing and Closing the Building to the Public	75
4. Stabilizing the Building and Leasing the Mill to Another Organization to Develop and Run a Program for the General Public	76
5. Between 3 and 4	77
6. Transferring ownership	77
7. Renting	79
Technical and Program Issues	80
Technical Issues	80
Toilet / Sewage / Water supply	80
Electricity	81
Hydro Electrical Power	81
Solar Energy	82
Funds and Loans for Renewable Energy Projects	83
Handicapped Access	83
Program Issues	84
The Water Wheel	84
The Nature Conservancy	85
6. Conclusions and Suggestions	86

APPENDIX

I. Names, Addresses and Phone Numbers of Individuals and Organizations Interviewed by the Author	89
II. Chain of Title	91
III. Hydropower References	93
Hydropower Equipment Manufacturers and Hardware Suppliers	93
Periodicals and Magazines That Report on hydropower	95

IV. Mill Drawings	96
Selected Bibliography	104
Books	104
Research Papers	104
Articles	105
Brochures.....	105
Other Sources of Information	106
Interviews by the Author	106

Figures

1.	General View of Van Wyck Lefferts Tide Mill (north elevation). Dam; Bridge over the tidal gates on the right; what was the original miller's house on the far right. (HAER NY-106-1).....	1
2.	Schematic Map of Long Island	2
3.	Motions used with early milling implements (Storck pg. 44)	5
4.	Ways of supplementing arm power while using mortars (Storck pg. 47)	6
5.	Norse-type direct-drive mill, Scotland (Storck pg. 98).....	7
6.	Types of water wheel. A, horizontal wheel with vertical axle, the direct-drive type. B and C, vertical wheels with horizontal axles. C is the type described by Vitruvius. (Storck pg. 94)	7
7.	Seal of the city of New York, including a set of windmill sails. (Howell & Keller pg. 120).....	10
8.	Overshot Wheel, powered by a head of water striking the wheel just forward of its highest point. (Evans, Appendix, plate III).....	11
9.	Pitchback Wheel, water strikes the wheel at or just in back of its highest point. (Evans, Appendix, plate III)	11
10.	Breastshot Wheel, three types of breastshot wheels - low, middle and high wheels. They differ slightly from Overshot Wheels, and they must be wider in proportion as their head of water is lower. (Evans, Appendix, plate II)	12
11.	Undershot Wheel, water strikes the wheel near the bottom. (Evans, Appendix, plate I)	13
12.	Millstone dresser at work, and various millstone dress. (Storck pg. 104)	16
13.	Evans' own schematic of his mill. Grain is poured from a wagon into a bin, from which an elevator raises it above a rolling screen for cleaning. The clean grain is delivered to the stones for grinding, whence the meal is carried by conveyer and elevator to the hopper-boy for drying and cooling. Under the hopper-boy are the bolters for spreading the various grades of end product. (Storck pg. 164)	19
14.	Complete layout of a mill utilizing the Evans improvements. Notice #28 & 29 are unloading grain from the boat. (Storck pg. 165).....	23
15.	The Saddle Rock Mill, (the mill's brochure).	30
16.	Saddle Rock Mill, metal gears are enclosed to avoid the entry of animals.....	32
17.	Saddle Rock Mill, millstones with little machinery on the back.....	32

18.	Roslyn Mill, general view from the back. Advanced deterioration showing, as well as changes that were done to the facade.....	34
19.	Interior of Roslyn mill.	36
20.	Stony Brook Grist Mill, general view from the back. (Mills' brochure)	37
21.	View of the millstones.....	40
22.	The gift shop.....	41
23.	The Bolting Machinery.....	42
24.	The New Mill in Blydenburgh Park, general view.	43
25.	The mill on the Connetquot River, general view (from the mill's brochure).....	46
26.	The Van Wyck Lefferts Tide Mill - southwest elevation.	47
27.	The mill with its wheel still intact but badly damaged, southwest elevation. (HAER NY-106-19)	50
28.	V style half-timbering of the south wall.	55
29.	Horizontal and vertical half-timbering of the east wall.....	55
30.	Evidence of original sunbaked bricks, see north west corner where the bricks are white washed.....	56
31.	Isometric view of the wooden gearing. The surviving gearing is shown in darker lines. (HAER)	59
32.	Interior view of southwest corner, with the enclosed gears. The mechanism controlling the distance between the stones is operated by the lever in the top left corner. (HAER NY-106-11).....	60
33.	Inside the cog pit; great spur wheel and wallower on left, auxiliary pinion on right. (HAER NY-106-13)	61
34.	Interior, second floor, looking southwest. Stone, hopper, horse, crane with runner stone (on the right). (HAER NY-106-6).....	62
35.	Second floor: Stone with hopper and horse on the left; Garner and remaining cups from the elevator in the center; crown wheel on the right. (HAER NY-106-08)	63
36.	Second floor, loose machinery: shafts, and a conveyer (HAER NY-106-10)	64
37.	Bowing first floor.....	66
38.	Badly deteriorated wood sidings, south elevations. Also notice the original location for the water wheel.	67
39.	Efflorescence on the bricks of the north wall.	69

Drawings

1.	Location Plan.....	96
2.	Site Plan.....	97
3.	Structural Isometric (HAER).....	98
4.	Site Elevation.....	99
5.	Mills Floor Plans	100
6.	Structural Plans.....	101
7.	Elevations	102
8.	Sections	103

Acknowledgments

Completion of this project was made possible with the help of many individuals and organizations. Special thanks are due to Zack Studenroth, director of Huntington Historical Society, who suggested the project, and gave me information, access to the site and patience to answer my tedious questions.

I would also like to thank all the owners and operators of the various mills on Long Island, who made special effort to show me the mills which were closed to the public during the winter. The material, stories and information given to me by them were of great help.

Many thanks to Dr. Barbara Kelly, head librarian at the Long Island Study Institute, and Chris Kennett, for helping me gather the books and related materials to start this paper.

At the University of Pennsylvania I would like to thank Professor John Milner for his supporting knowledge in historical preservation, and his insight to the key issues involving interpretation; Dr. Christa Willmanns-Wells, my reader, for her support and help in presenting this paper; Professor David De Long, Chairman of the Department of Historic Preservation, who kept up with my unusual requests over the last two years.

And to keep this section short, I would like to thank all the individuals that supplied me with material and information on related subjects.

Chapter 1

INTRODUCTION

This thesis investigates a water operated grist mill named Van Wyck Lefferts Tide Mill located in Huntington, Suffolk County, Long Island, New York (See Fig. 1, pg. 1).



Fig. 1 General View of Van Wyck Lefferts Tide Mill (north elevation). Dam; Bridge over the tidal gates on the right; what was the original miller's house on the far right. (HAER NY-106-1)

Long Island was known for its flour milling industry, and was one of New York's major wheat and flour regions during the 18th and 19th centuries. The Island was dotted with water and wind operated mills that produced various goods in addition to flour.

The Van Wyck Lefferts Tide Mill, which was built between 1793 and 1795, is an excellent example of a typical Long Island water operated grist mill in its equipment, grinding process, and its place in the local economy. The mill is especially recognized for its unique original wooden machinery which was left untouched inside the mill. It is considered to be the last remaining example of its kind in the country. Not only it is one of a few water operated mills that survived on the Island, but even more interesting, it is one of only two surviving tidal mills which were once very popular on the north shore of Long Island. Recognizing its uniqueness, the Historic American Engineering Record completed a survey of the mill in 1975 (see Appendix IV for drawings).

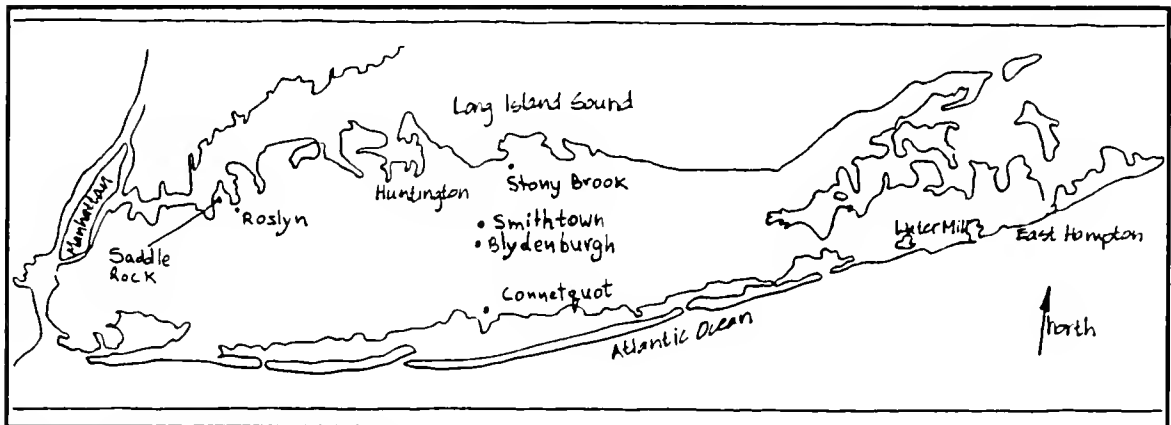


Fig. 2 Schematic Map of Long Island

The Van Wyck Lefferts Tide Mill was donated in 1969 by its last owner, the DeClairville family, to the Nature Conservancy Long Island Chapter. Beside emergency repairs, no full restoration ever took place and the building was never opened to the public. The site and its ownership have many problems that resulted in the ongoing deterioration of the building on the one hand, and lack of concentrated action to come up with long term solution to save the building on the other.

The objective of this paper is to analyze the problems this building and site are facing, and to come up with a set of alternative suggestions for preserving and interpreting the site. I have tried to tackle the problem as a whole, acknowledging the main problems and understanding the best ways to deal with this special site, building, and machinery.

To properly understand Van Wyck Lefferts Tide Mill, its history and technology as well as its importance and place in the Long Island milling industry, I also investigated other comparable and related subjects which included:

- The study of the milling industry in general and the one on Long Island in particular.
- Visiting other surviving water mills on the Island, and related museums.
- Interviews with people related directly or indirectly to the subject.
- Gathering related material from various institutes and individuals.
- Library research at the University of Pennsylvania; Huntington Historical Society, Great Neck Library, and Long Island Study Institute.

Chapter 2

HISTORY OF MILLING

"Bread, milk and butter are of venerable antiquity. They taste the morning of the world."

Leight Hunt¹

Early History

Man was grinding grains very early in human history and wherever plants were part of human diet grinding and rubbing tools were found. The earliest grinding tools found are 75,000 years old,² and were powered by the human arm. These grinding tools consisted of two simple stones, one stone was held in the hand and worked against another stone that was lying on the ground in an up and down, back and forth, or round about motion (Fig. 3). Later this simple technique, using hand power to do the grinding, was developed and mankind began using alternative power sources (Fig. 4). One of the more effective energy sources was animal power, but grinding with power supplied by man or animal was slow and inefficient.

¹ John Storck and Walter Dorwin Teague, *Flour for Man's Bread, A History Of Milling* (Minneapolis: University of Minneapolis Press, 1952), 3.

² Storck and Teague, *Flour for Man's Bread, A History Of Milling*, 18.

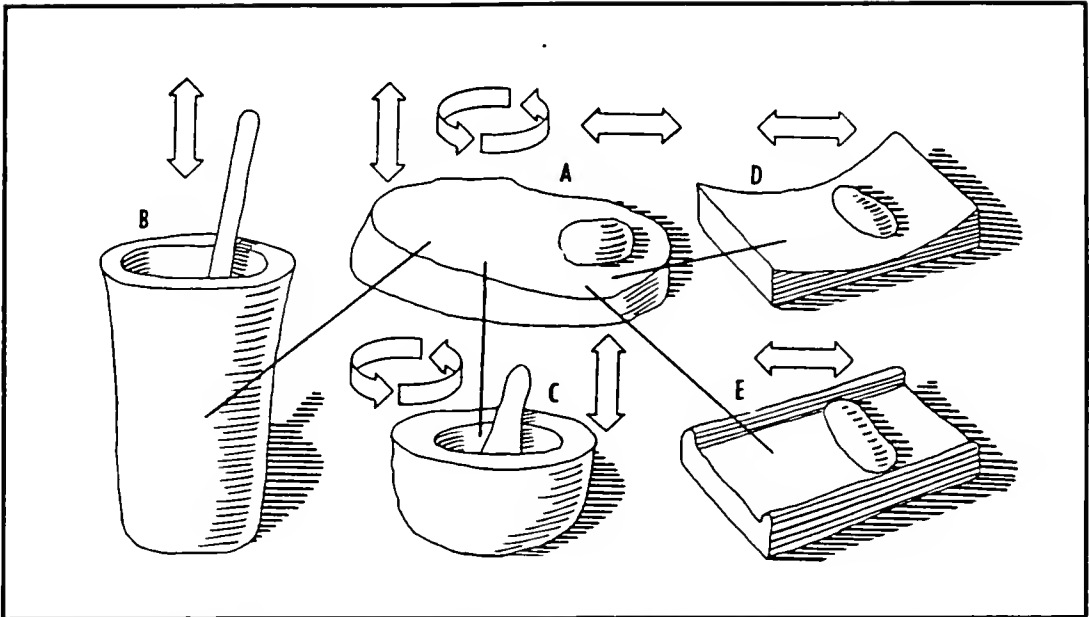


Fig. 3 Motions used with early milling implements (Storck pg. 44)

The Greeks were the first to take another step forward when they turned to water for power (first recall is from 85 BC).³ Using a horizontal water wheel the water operated a very simple mill, this type of mill was in use until recently in parts of Portugal, Spain and in Latin American countries.⁴ One of the versions of this type of mill is the Norse type (Fig. 5). Later the horizontal wheel was developed to a 'tub mill' and was used by the Spanish in Mexico and California.⁵

³ Charles Howell and Allan Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling* (Tarrytown, NY: Sleepy Hollow Restoration, 1977), 22. Charles Howell was a miller and a millwright, he was considered to be a high authority in milling in this country. Unfortunately he passed away last October.

⁴ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 25.

⁵ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 25.

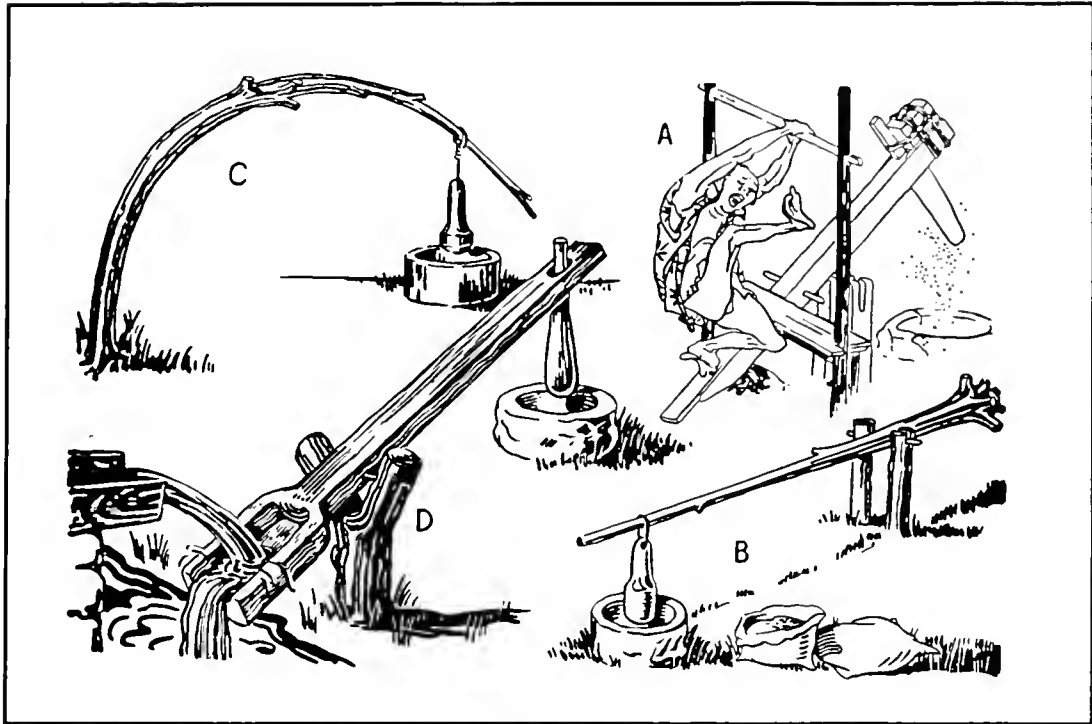


Fig. 4 Ways of supplementing arm power while using mortars (Storck pg. 47)

The Romans took another step forward when they developed the vertical mill, which in the beginning lacked the gears. The earliest description of a vertical water mill is found in the writings of Vitruvius (between the years 20 and 11 BC).⁶ This type of mill, which has a vertical water wheel fastened to a horizontal drive shaft with gears to transmit the power to the millstone (Fig. 6), was the most popular mill for many centuries. Later on, these gears were also used to increase the speed of the spindle on which the runner stone was supported, the ratios were determined by the miller (The early settlers in America on the Atlantic coast used this type of mill).

⁶ L.A. Moritz, *Grain-Mills and Flour in Classical Antiquity* (Oxford: The Clarendon Press, 1958), 122.



Fig. 5 Norse-type direct-drive mill, Scotland (Storck pg. 98)

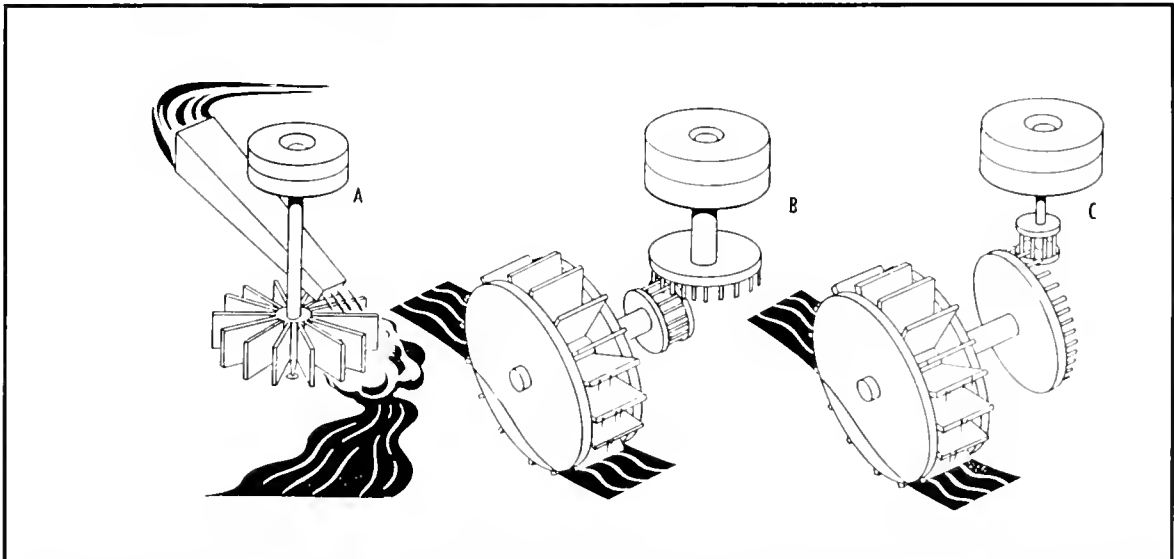


Fig. 6 Types of water wheel. A, horizontal wheel with vertical axle, the direct-drive type. B and C, vertical wheels with horizontal axles. C is the type described by Vitruvius. (Storck pg. 94)

Milling in America and Later History of Milling

In the time between Vitruvius and the arrival of the new settlers in North America, aside from minor improvements, there was very little change in the way mills were built and operated.

Nature in North America supplied the new settlers with plenty of wood and many strong streams, so this type of water powered mill could have been built relatively easily and could have operated in most areas with the exception of the extreme northern region of the country. During the 17th and 18th centuries there were thousands of mills in North America⁷ which performed a variety of tasks like producing cider and linseed oil, sawing wood, grinding plaster and other operations.

The mills were operated by water or by wind, each type had its own advantages and disadvantages. Water mills could not operate in some areas during the winter because the water froze, while windmills could not operate without wind which was the case on many of the summer days. In a way these two types complemented each other, but the vertical water wheel took the lead in North America.

The first mill to be built in North America was a water operated mill. It was built in 1605⁸ by the French in Arcadia, in what is today Annapolis Royal, by 1734 there were 118 mills in New France.⁹ These mills, in the early days of the country, demanded a great

⁷ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 31.

⁸ B.W. Dedrick, *Practical Milling* (Chicago: National Miller, 1924), 21.

⁹ Dedrick, *Practical Milling*, 22.

deal of labor, which included a lot of lifting and carrying. Oliver Evans was the first after Vitruvius to take another important step to improve milling, when he introduced the technology for the automatic milling process in 1785 (see page 17).

Windmills

Only long after man had started operating mills with the power of water did he start using wind for that same task. The milling technique of the windmill originated from the water mill, except that the source of power was different. The first historic record of building a windmill dates back to 644 AD in Persia, with the idea of that first windmill coming from the ancient horizontal mill. In its early stages the windmill had no gears, while later, under the influence of the vertical water mill, gears came into use. Geared windmills are first mentioned in France and England in the 12th century (France in 1180 and in England in 1191).¹⁰

Windmills were used by both the English and the Dutch in America and were most popular in Cape Cod and Long Island (Long Island has the largest number of surviving structures of old type windmills in the country).¹¹ In 1640 there were a large number of windmills on Manhattan Island. This has left its trace on the seal of the City of New York which includes a sail of a windmill (Fig. 7).

¹⁰ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 104.

¹¹ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 110.

The first windmill erected in America was built in Virginia in 1621.¹²



Fig. 7 Seal of the city of New York, including a set of windmill sails. (Howell & Keller pg. 120)

Water Mills

The water operated mills are divided into four groups according to the type of wheel used to generate power. One type is differentiated from the other by the point on the wheel at which the water strikes. The four types are displayed in Fig. 8 to Fig. 11:

¹² Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 121.

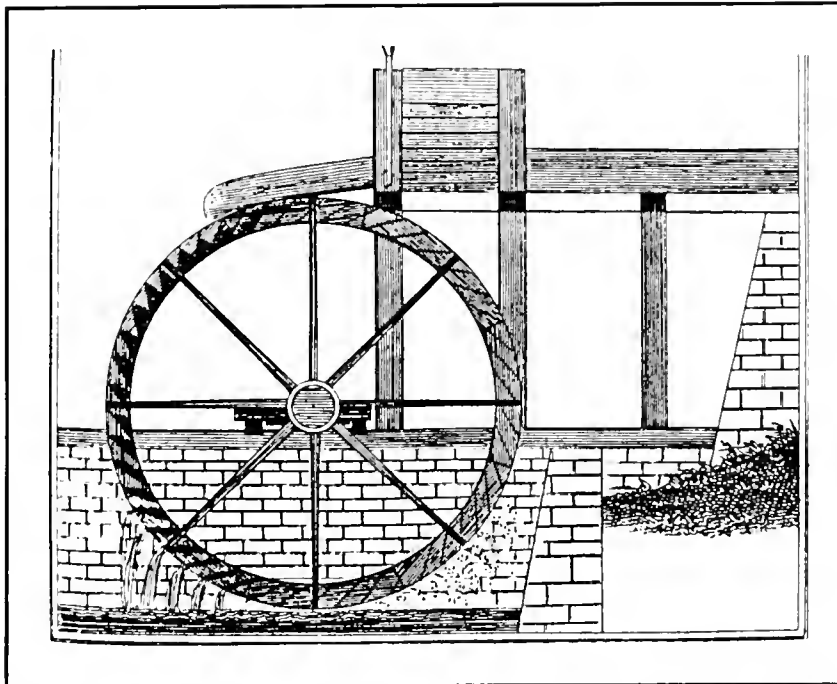


Fig. 8 *Overshot Wheel, powered by a head of water striking the wheel just forward of its highest point. (Evans, Appendix, plate III)*

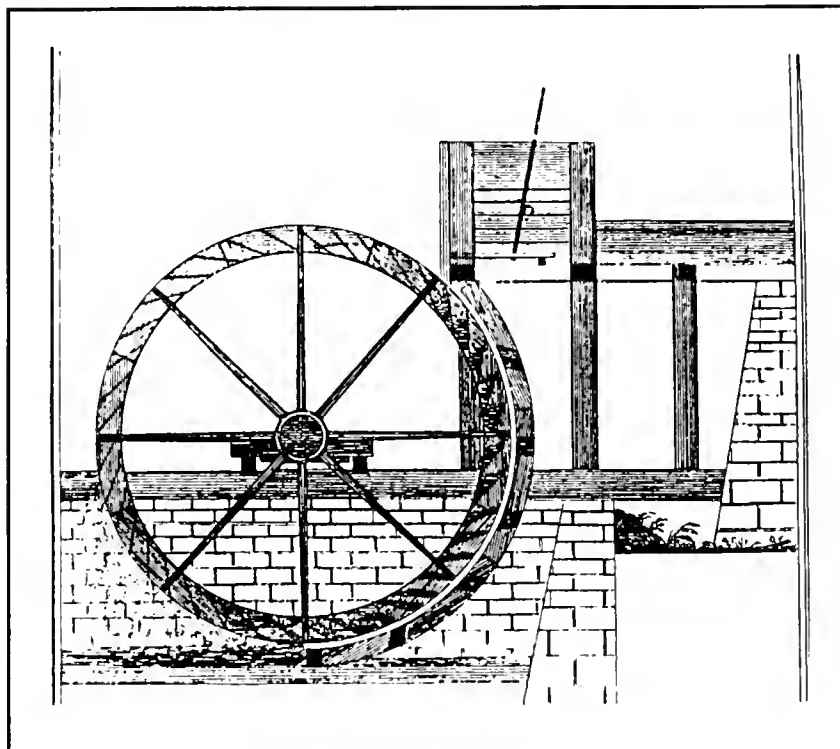


Fig. 9 *Pitchback Wheel, water strikes the wheel at or just in back of its highest point. (Evans, Appendix, plate III)*

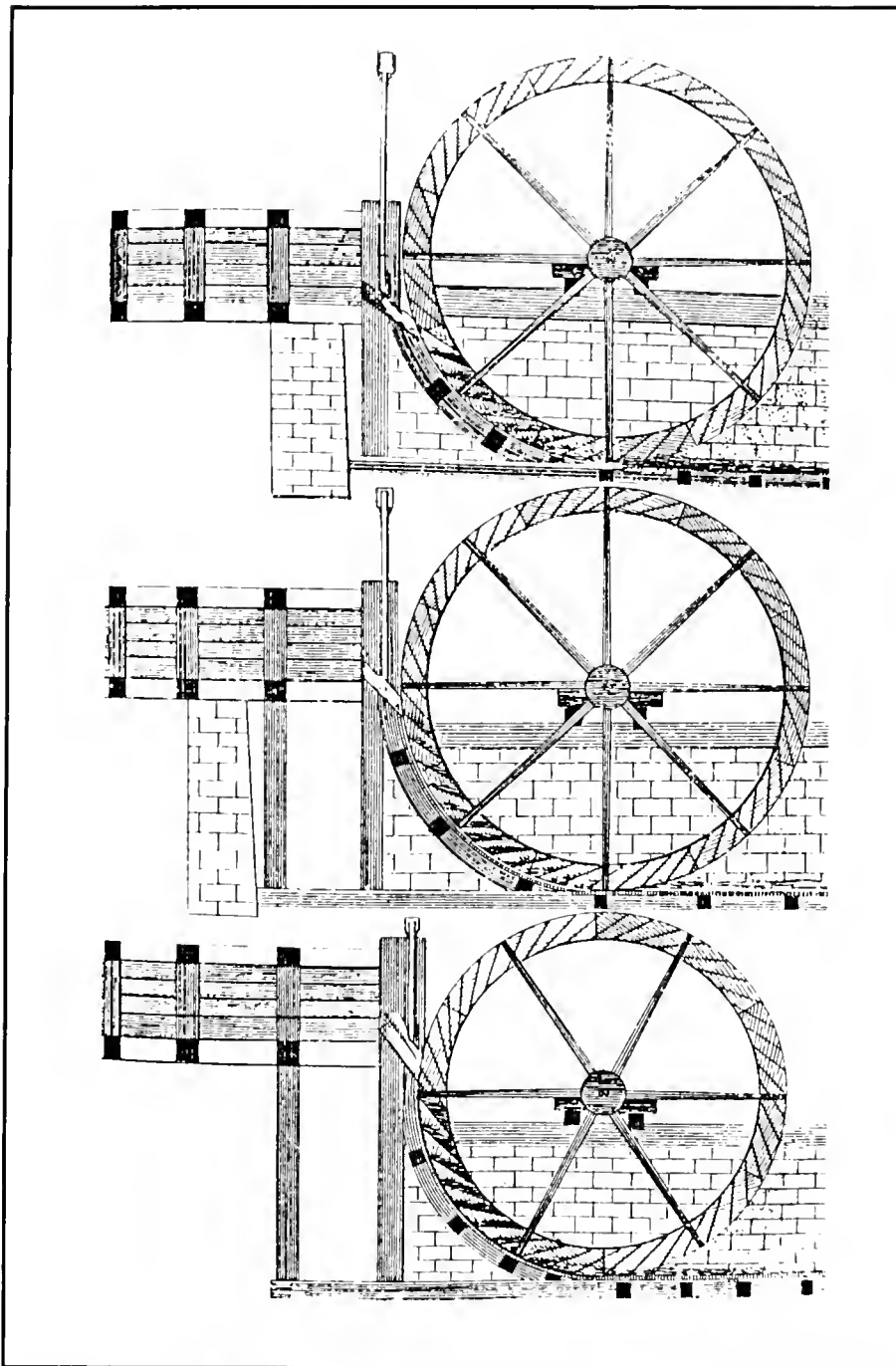


Fig. 10 Breastshot Wheel, three types of breastshot wheels - low, middle and high wheels. They differ slightly from Overshot Wheels, and they must be wider in proportion as their head of water is lower. (Evans, Appendix, plate II)

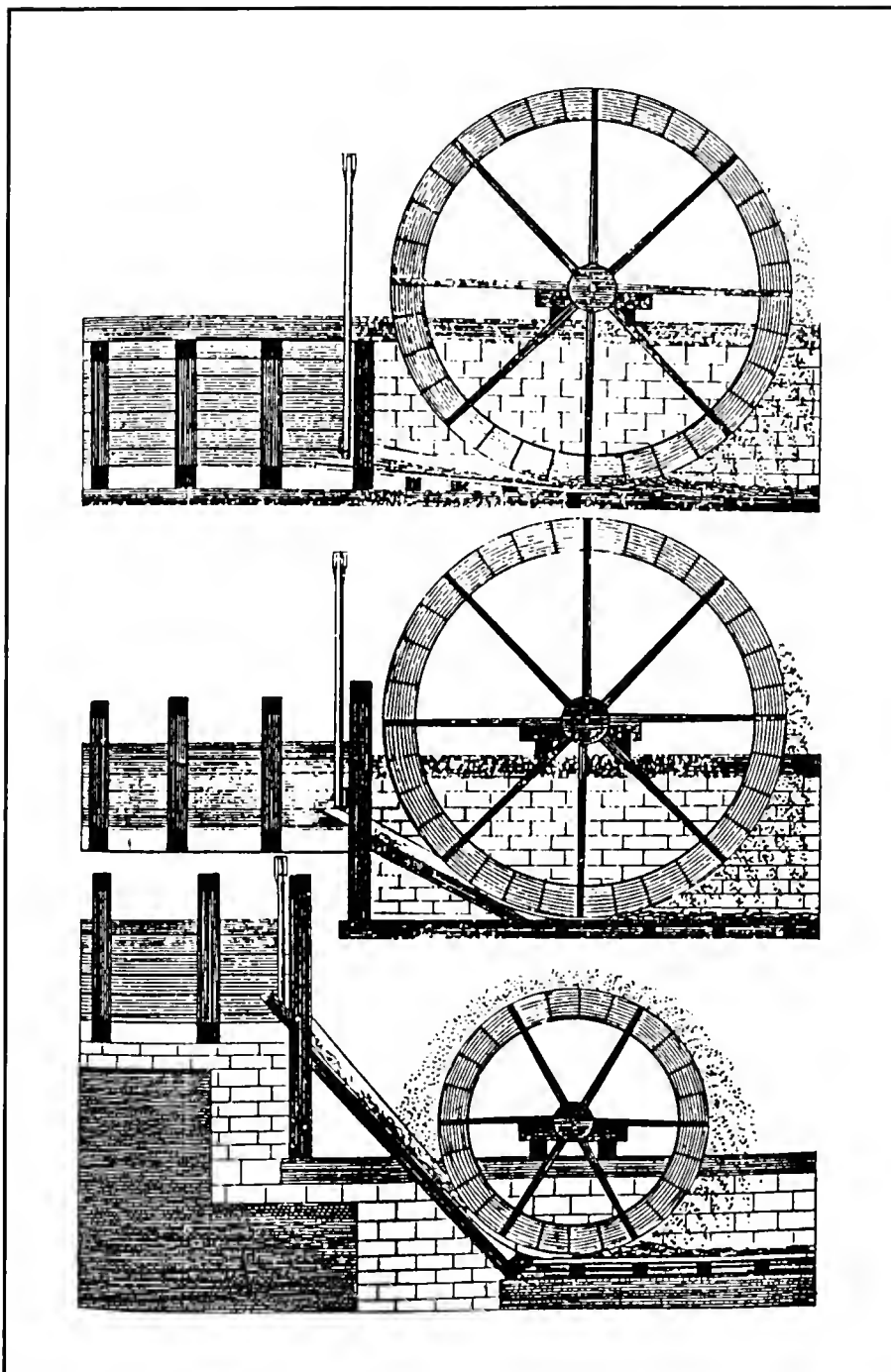


Fig. 11 Undershot Wheel, water strikes the wheel near the bottom. (Evans, Appendix, plate I)

Since the Van Wyck Lefferts Tide Mill, which is the subject of this paper used an undershot wheel, to operate its machinery, I will concentrate on that type of wheel only.

The undershot wheel was used when a low fall of water (water head) was available. The water strikes the undershot wheel on the bottom which requires a bigger quantity of water for generating the same power than is generated with the other types of wheels (a higher fall of water has the advantage of the weight of the water falling upon the wheel from above as is the case in an overshot wheel). The wheel itself was 10 to 25 feet in diameter and ran in an enclosed channel (in the early colonial days the wheels were between 10 to 15 feet and the channel was built out of wood or stone).¹³ The water came from the headrace or millpond through a sluice gate, the gate was located as close to the wheel as possible and in an angle to create a downward path.

In colonial days, the wheel was built out of wood and had five components:¹⁴ shaft, arms, shrouding or rims, sole or drum boards, and partitions which formed the buckets or floats.

The shaft was usually made out of oak and its diameter in gristmills was 18-24 inches in a circular, polygonal or square form, with iron bands fitted around it.¹⁵ The dimensions and details of the wheel were determined by the head of water available on the specific site. For maximum efficiency the tail water (the water that leaves the wheel at the bottom) should leave the area as quickly as possible, in order to achieve this, a free flowing tailrace was built from wood or stone. The tailrace was laid in the direction of the

¹³ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 121.

¹⁴ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 121.

¹⁵ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 35.

stream to allow the tail water to join the stream in an easy manner. A few different kinds of wood were used for building the water wheel: oak was common; pine of certain types was long lasting; cypress was considered to be the best rot-resistant wood. Since the wheel was subject to changing weather conditions, repairs were part of its regular maintenance. Besides the main shaft, most of the wooden parts were replaced or repaired periodically every five to ten years.

The first water mill was built in Massachusetts in 1633.¹⁶

Millstones

The best milling stones were called French Burr Millstones, and were the best for grinding wheat into white flour (these freshwater quartz stones were quarried in northern France). The stone was usually found in small pieces, and as the French millstones size was about 4 feet, the pieces had to be assembled together into a working surface (Fig. 12). Once in a while, the millstone had to be ‘dressed’, in order to do that the stationary stone (the top one) had to be removed with the help of a special mechanism.

¹⁶ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 32.

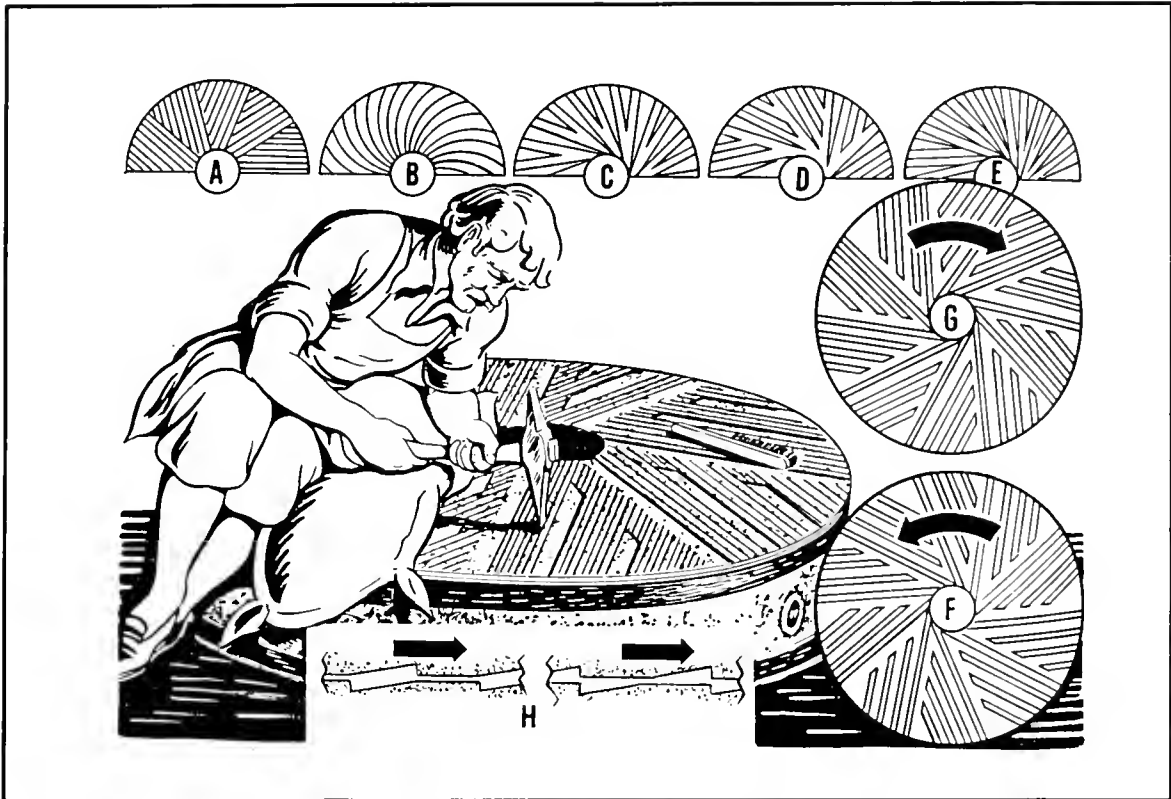


Fig. 12 Millstone dresser at work, and various millstone dress. (Storck pg. 104)

Tide Mills

The Van Wyck Lefferts mill is a tidal mill, instead of generating its power from water coming downstream and filling a pond, it generates its power by using tidal water (that fills a pond). Since the head of the water was low, these mills used an undershot wheel, and a dam had to be built to achieve the desired head of water. Some of the dams were constructed from rocks and stones, while others were built with wood logs or a combination of the two. The dams were built with gates to contain and trap the water, so when the tide was high the water forced the gates to open and filled up the pond or the

valley. When the tide would start ebbing, the pressure from the water in the pond would close the gates and the water would be trapped in the pond. When the tide was completely ebbd and a sufficient water head was available, the water from the dam flowed through the flume or sluice way in a channel that was usually of timber construction and varied in length from one mill to the other. Since it relied on tide, the mill would only operate twice daily, for 5½ hours each time.

The first tide mill in America was erected in Flatsbush, then known as Midwout in 1635.¹⁷

Oliver Evans and the Automatic Mill

Oliver Evans (1755 - 1819) advanced milling technology the most since Vitruvius' invention of the vertical mill. At the age of sixteen he was an apprentice to a wheelwright,¹⁸ he was also involved in mechanical inventions of various kinds as well as writing about them. He wrote two books:¹⁹ The Young Mill-Wright and Miller's Guide (1795; 15th edition 1850), and The Abortion (sic) of the Young Steam Engineer's Guide (1805), and also published articles and pamphlets defining and explaining his patents. Not all of his inventions were listed or patented, and some of the ones that were patented were never used.²⁰

¹⁷ Howell and Keller, *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*, 32.

¹⁸ Storck and Teague, *Flour for Man's Bread, A History Of Milling*, 160.

¹⁹ Storck and Teague, *Flour for Man's Bread, A History Of Milling*, 160.

²⁰ Storck and Teague, *Flour for Man's Bread, A History Of Milling*, 163.

Evans invention of the automatic mill in 1785²¹ changed the involvement of man in the process of milling. Prior to his invention the miller did a lot of lifting, he carried the grains up to the mill by hand or with the help of a rope or a pulley. Using sacks or other containers he lifted the grains and dumped them into the hopper over the grinding stones. In case the bolters were not directly below the stones, it was necessary to carry the flour from one point to the other. The earlier mill was not continuous or automatic, and it needed a few people to be operated.

Evans introduced the 'worm conveyor', the 'elevator', and the 'hopper boy' also known as 'the cooler' (all to be explained later).²² From then on hard labor was replaced by machinery, the process was continuous, and the mill could be operated by only one or two people. Except for the need to inspect certain parts of the process, there was no need for any manual intervention from the point of receiving the grain into the mill to the point where the flour was ready. "Evans made gravity the miller's friend instead of his enemy".²³ Therefore the new mill saved the labor involved in carrying materials from one point to the other, as well as providing an operation that was working continuously. Yet, the new labor saving machinery and devices were not welcomed by all the millers, but on the contrary, they brought a lot of criticism of Evans.²⁴

²¹ Oliver Evans, *The Young Mill-Wright & Miller's Guide* (Wallingford: Reprinted from the first edition 1975 by Oliver Evans Press, 1990).

²² Dedrick, *Practical Milling*, 22.

²³ Storck and Teague, *Flour for Man's Bread, A History Of Milling*, 166.

²⁴ Storck and Teague, *Flour for Man's Bread, A History Of Milling*, 163.

Evans was probably the first one to draw a plan for a mill²⁵ including conveyors, elevators, and 'hopper boys' all driven by the same power (Fig. 13).

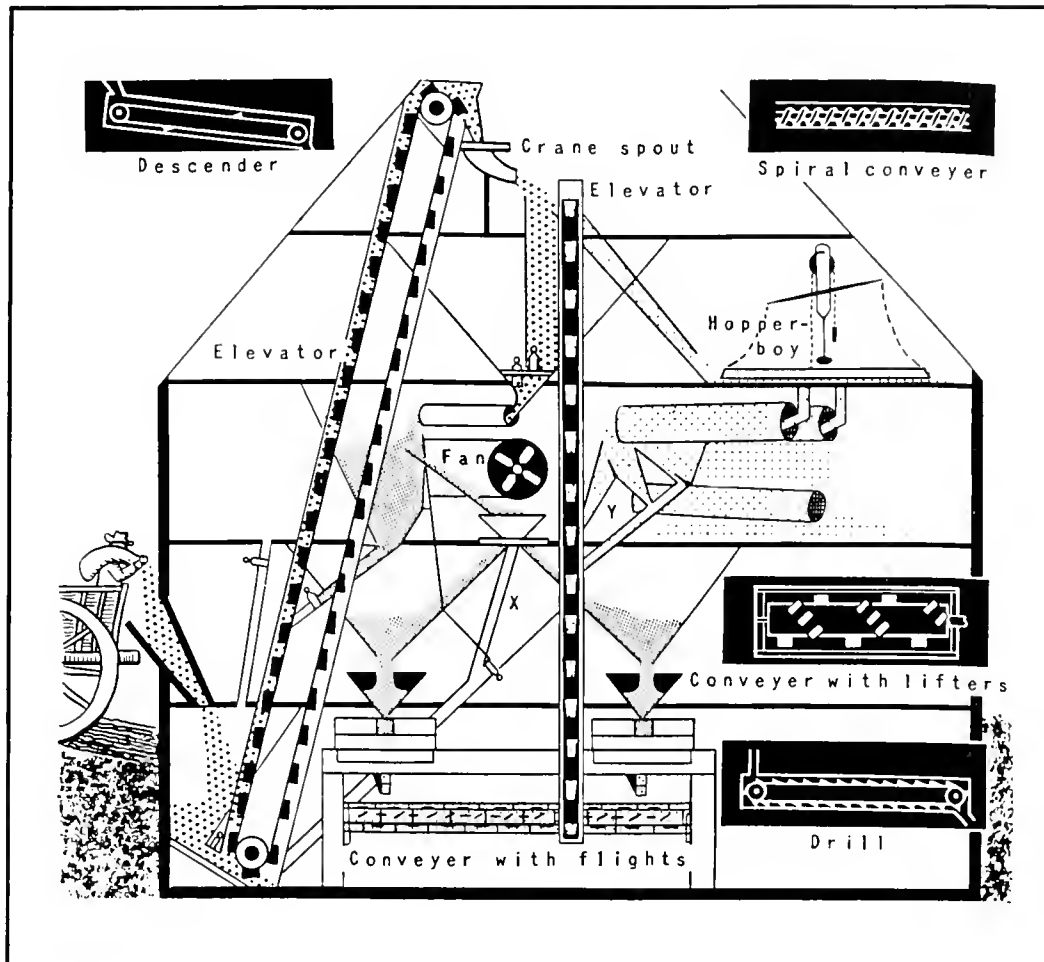


Fig. 13 Evans' own schematic of his mill. Grain is poured from a wagon into a bin, from which an elevator raises it above a rolling screen for cleaning. The clean grain is delivered to the stones for grinding, whence the meal is carried by conveyor and elevator to the hopper-boy for drying and cooling. Under the hopper-boy are the bolters for spreading the various grades of end product. (Storck pg. 164)

His basic idea was to lift the material to the top of the mill and with the power of gravity to pass it down through the machines. This process could have been repeated as

²⁵ Storck and Teague, *Flour for Man's Bread, A History Of Milling*, 163-164.

many times as needed to achieve the required finesse of the flour. The “transportation” of material was one of the most important aspects in the automatic mill. To achieve that Evans invented the elevator (vertical transportation) as well as the worm conveyor which transported material horizontally on each floor helped to arrange the machinery on each floor.²⁶ In his drawing (Fig. 13) Evans showed how the grain arrived at the mill by means of transportation, and from there how it was dumped into a hopper, then conveyed into another hopper or bin and by elevator carried onto the upper floors. If the grains came on a boat, a special elevator was used to unload them from the boat and to carry them onto the top floor (Fig. 14). These elevators were one of Evans’ most important inventions, and although this device was described in his *The Young Mill-Wright* it came into use only in 1843.²⁷ The elevators consisted of small buckets on an endless belt, the load was constant and light which made the operation possible. The buckets passed over a pulley at the top and dropped the material into a bin on the upper floor on their way down. Sometimes the grains were cleaned once or twice before going into the bins, and then were drawn to be ground. Movable spouts were used in different parts of the process to control the direction of the grain or ground meal flow.

As was mentioned, Evans suggested cleaning the grain prior to grinding, and used several methods to do so.²⁸

²⁶ Storck and Teague, *Flour for Man’s Bread, A History Of Milling*, 166.

²⁷ Storck and Teague, *Flour for Man’s Bread, A History Of Milling*, 165-166.

²⁸ Storck and Teague, *Flour for Man’s Bread, A History Of Milling*, 167-168.

- When the grain arrived at the mill by a wagon, it was cleaned by an air blast while being dropped into the receiving bin.
- Using millstones positioned far from each other, so when the grains went through the stones they were rubbed and cleaned without being ground.
- Using rolling screen with two sieve wire cylinders, the inner screen was large enough to pass the grains and hold any larger size dirt (small animals for example). The outer screen was made with a smaller mesh to pass all the small dirt and to leave the grain behind. After being separated, the grains were dropped into a wind tube, the good grains fell into a conveyor and into the stones to be ground while the light particles could be returned for screening.

One of the problems in the old type mill was cooling the meal after it came out of the milling stones, as processing hot meal through the bolter would clog the cloths. The old method to cool the hot meal was to shovel it onto the floor for drying and after it was cooled it was carried to the bolters. Evans' improvement of this process is called the 'hopper boy', referring to the boys that used to do the work by hand before his invention. The hopper boy, an invention that Evans was most proud of, was a device that was used to spread the hot meal to let it cool. A conveyer received the meal from the stone and by elevator the hot meal was carried up to the hopper boy. The hopper boy was a perpendicular shaft rotating about four times in a minute, the lower arm of this device had downward projecting flights loosely fitted. The meal or flour that was delivered by the

elevator was directed by a spout to the outer end of the arm, and then spread by the flights around the circle for cooling. The cooled meal was slowly pushed to the center where a hole was and then the grain fell into the bolter. The cooling period could be adjusted. The hopper boy was usually enclosed to prevent the dust from spreading over the mill.²⁹

After the meal was cooled, it was processed through silk screening (called bolting). A good mill was not only the one that had the best millstones but also the one that had the best sifting which meant good bolting machinery (in earlier periods the bakers used to do their own bolting). The fine flour dropped into a packaging chest, which was the first time manual work was needed.

Some of the ideas Evans introduced were known before, for example reducing the number of times the stone revolved to produce a better quality flour. He also directed that the flour be ground more times but with less pressure each time (both French ideas). There were some ideas that Evans never thought about like those in the French system which divided the process into stages and gave each class of materials special treatment.

The way Oliver Evans organized the process in his automatic mill was a model for the rest of the industry and had an impact beyond grist milling. Evans analyzed the old mill and found that it was dirty and wasteful. He noted that in the old fashioned mill seven tasks were performed by hand: carrying the grain, hoisting it, carrying it from the granary to the hopper, collecting the grist into tubs, hoisting it, watching the bolter, mixing the

²⁹ Dedrick, *Practical Milling*, 25-26.

bolted material. All of these tasks required employing seven people at the same time or operating the mill with fewer people but on an intermittent basis. Mills equipped with Evans' machinery needed only one person to produce 20 barrels of flour per day, whereas in the old fashioned mill one person could produce only 10 barrels per day.³⁰

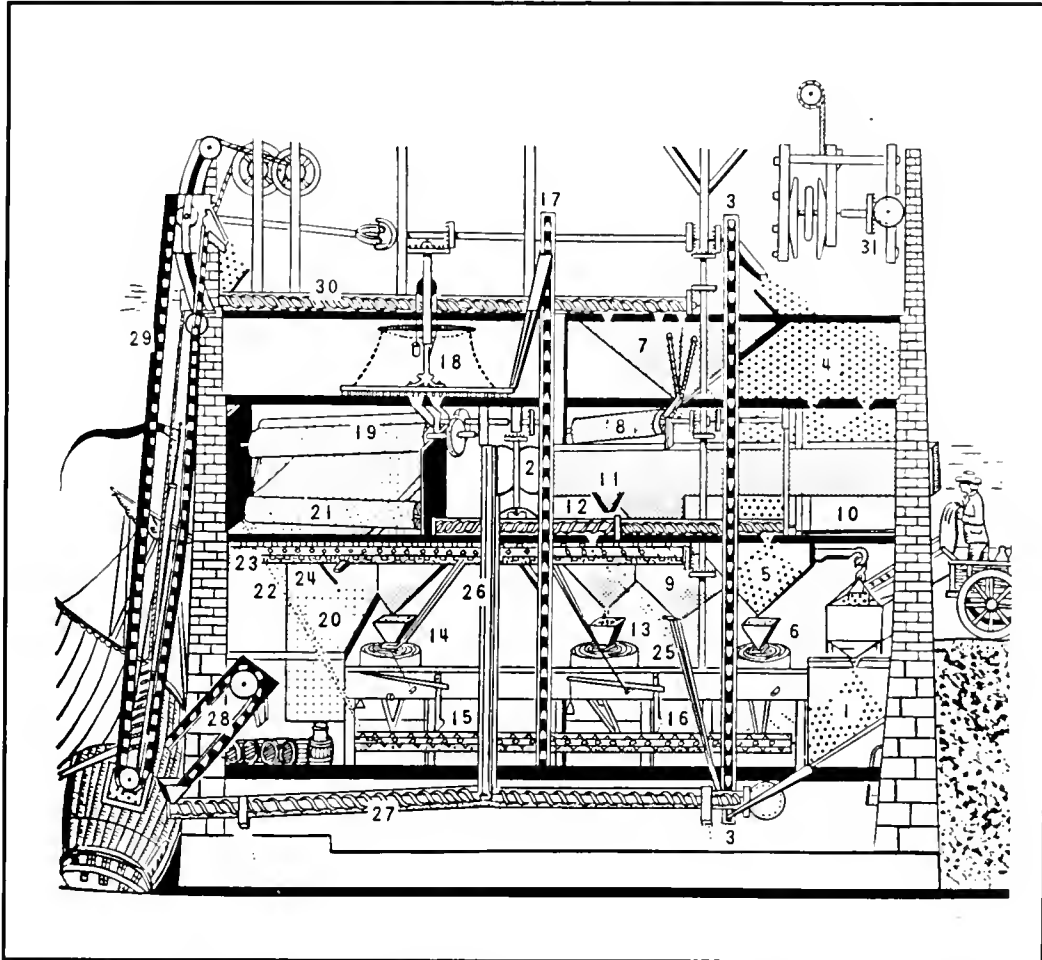


Fig. 14 Complete layout of a mill utilizing the Evans improvements. Notice #28 & 29 are unloading grain from the boat. (Storck pg. 165)

Except for the 'hopper boy' Evans machinery was not a surprise to people who were familiar with mechanical devices. His invention was the arrangement and the

³⁰ Storck and Teague, *Flour for Man's Bread, A History Of Milling*, 174.

transport of material from one point to the other: “elevators to raise materials, gravity chutes to drop them, and conveyers to carry them sideways”.³¹ Evans machinery could be appreciated and used by people that were not only millers, but also, in part engineers and scientists. With his machinery a mill could run perfectly and with little attention, but it did require most careful adjustment to operate perfectly.

Towards the end of his life Evans’ ideas were gaining popularity, not only for his inventions in the milling industry but also for his steam engine.

In his book John Stork described Evans³²: “He was not a conventional miller or millwright, but the first thoroughgoing plant engineer.”³³

The milling industry is one of the best examples of how Europe and America were different in their production approach at that period. “*In Europe democracy had meant equal rights ... in America it meant equal opportunity.*”³⁴ The Americans were lucky to be able to transfer directly from the conquest of the new land to the beginning of the industrial system. In England, for example, the industrial production goal was supplying the upper class, instead of improving the standard of living for the whole society. The industrial workers were not considered to be the consumers of the goods for many years and automation was not the key issue. In America there was a different approach, one of

³¹ Storck and Teague, *Flour for Man’s Bread, A History Of Milling*, 164.

³² Storck and Teague, *Flour for Man’s Bread, A History Of Milling*, 163.

³³ Storck and Teague, *Flour for Man’s Bread, A History Of Milling*, 163.

³⁴ Storck and Teague, *Flour for Man’s Bread, A History Of Milling*, 158-159.

increased standardization and automation, so that mass production, with low cost per unit was the result. The power of machinery together with the ability of the people of America to produce and supply the every day needs at a low cost made democracy a practical possibility. This approach allowed a better standard of living for the middle and lower class, and created a country that provided equal opportunity for all.

The milling industry in America led the automation process with its improved machinery and almost no human intervention in the production of flour. Instead of relying on cheap labor (one must remember that slavery has been phased out during the 19th century, which was early compared with other places in the world), the industry adjusted itself, with the inventions of Mr. Evans, to the mass production of flour in a cheap and efficient way. So in a way, it is not of a surprise that these kind of inventions took place in America.

Chapter 3

LONG ISLAND AND ITS MILLING INDUSTRY

History and Other Facts

Prior to 1700 there were already more than 25 mills operating in Nassau and Suffolk counties³⁵ both in south and north shore communities. The first tide mill in the country, Gerritsen Tide Mill, was built in Long Island during 1636 in Flatlands, Brooklyn, NY.³⁶ Until the mid 19th century Suffolk County's flour milling was a decentralized industry consisting of many small gristmills, (both water and windmills).³⁷ With the introduction of steam roller mills to the industry, water and wind operated mills started to decline and except for a few examples, these structures which once dotted the Island have disappeared.

The water mills on the south shore were usually located beside streams. The mills on the north shore were mostly on harbors along with a large number of tidal mills.³⁸ The coast line of the north shore is irregular with small inlets and coves that have narrow

³⁵ Jaray Cornell, *The Mills of Long Island Parts I & II* (Long Island, NY: Ira J. Friedman, 1962), 34.

³⁶ Marion N. Rawson, *Little old mills*. (E.P. Dutton & Co. Inc., 1935, n.p.), 98.

³⁷ Christine M. Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey" (HAER No. NY-106), 2.

³⁸ Jaray Cornell, *The Mills of Long Island Parts I & II*, 34.

outlets to the Long Island Sound creating a natural home for tidal mills. Dams were built across the outlets so the power of the tide could be utilized.

In general, mills were operated either as a mercantile mill or as a custom or country mill. A mercantile mill was managed by its owner who purchased the grain outright, processed it into flour, and marketed it himself or sold it to a flour merchant. A custom or country mill would grind grain for the farmers in the area and would charge a fee which was usually ranged from 1/8 to 1/12 of the ground grain. The permission or grant for the operation of a mill was given by the town at a town meeting. This grant also provided the miller with farm and pasture. The stream rights that were given to the miller could be passed from one generation to the next, could be inherited, or could be sold. However, these stream rights could be taken away from the miller by the town if the mill was not completed on time or if it stopped operating.³⁹ Custom mills on the Island, were usually on property that was given to the miller by the town, and had further conditions and demands imposed on their operation. These conditions concerned the miller's duty to the town, the miller's toll, and the condition that miller return the mill to the town if it ceased operating.

Usually the miller's house and barns were located on the same site. In the early days the mill was unpainted while in later years it was sometimes painted red. The dams that were built on Long Island were slightly different from dams in other places as they

³⁹ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", 4.

were constructed of earth, and in many cases they carried a road wide enough to have two teams pass at the same time.⁴⁰

In the mid 19th century modern machinery came into use in the Island's mills as in many other places in the country.⁴¹ Steam-roller mills that were found in various areas on the Island (Southampton, Southold, East Hampton, Setauket, and Port Jefferson) could produce 10 to 12 times more flour than a water operated gristmill. As a result the county's water and wind mills had three options: to become a custom mill; to operate as a marginal business, or to be closed.

Beside the changes in the milling industry the Island agriculture was also changing. During the second half of the 19th century, it shifted from growing grain to garden vegetables, which reduced the immediate available grain to the small old grist mills.

Surviving Water Operated Mills on Long Island

This chapter concentrates on the surviving water operated mills in Nassau and Suffolk Counties which are owned by organizations. It will describe the mills and will shed some light on the way they were restored, interpreted, and operate today.

Other mills on the Island that are in private hands and were adapted into houses are not included in this report.

⁴⁰ Cornell, *The Mills of Long Island Parts I & II*, 34.

⁴¹ Storek and Teague, *Flour for Man's Bread, A History Of Milling*, 223-241.

Nassau County

This is the western county on the Island, and it is located between Suffolk County and New York City. The only two water mills that survived in Nassau County are on the north shore. One is the Saddle Rock Grist Mill in the Village of Saddle Rock which is part of the town of Great Neck, and the other one is the Roslyn Grist Mill in the town of Roslyn. These two mills are about 7 miles apart.

Saddle Rock Grist Mill⁴²

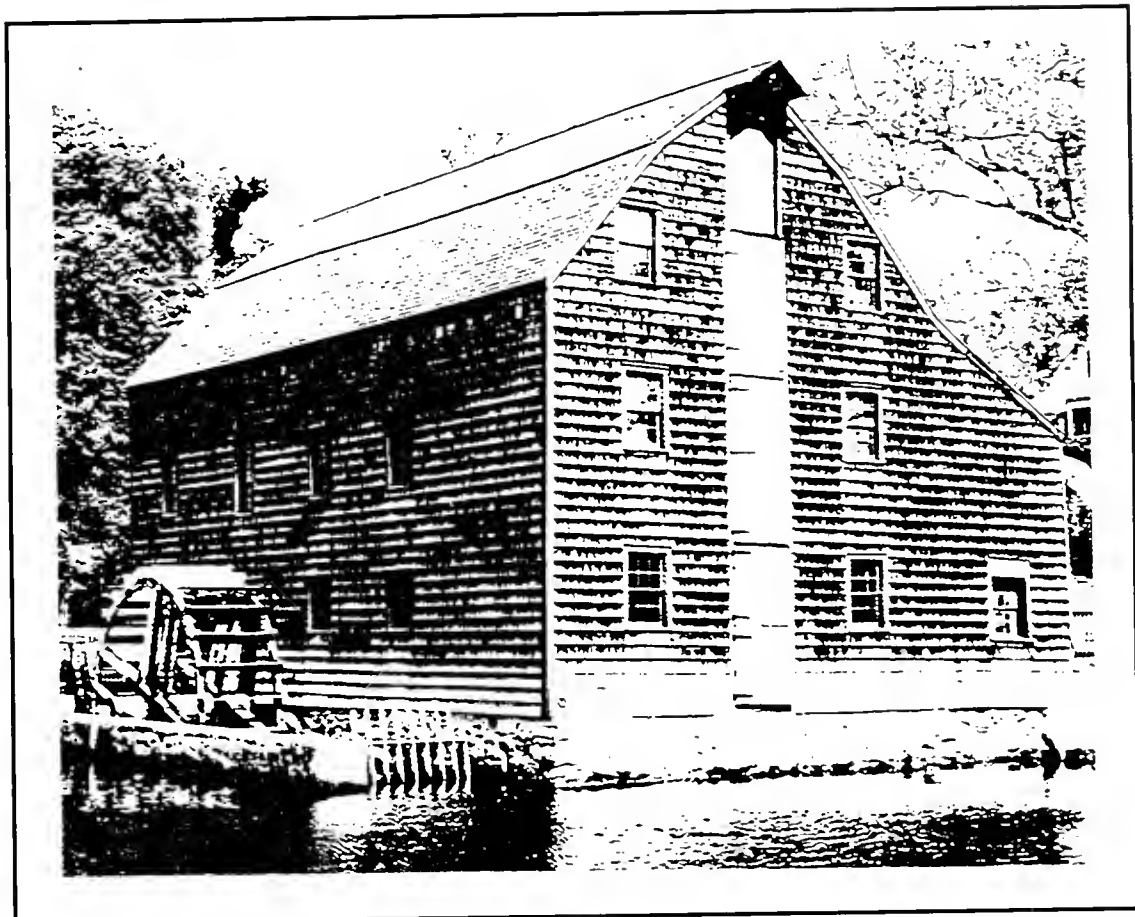


Fig. 15 The Saddle Rock Mill, (the mill's brochure).

The Saddle Rock Grist Mill is the only tidal grist mill left in Nassau County. The earliest record found for this mill dates back to 1702. The mill has none of its original wooden machinery. According to research that was done on the structure⁴³ the mill's machinery was revamped when Evans inventions were introduced at the turn of the 19th century. Later the mill's machinery was changed again. Today the mill has been restored

⁴² The information is based on an interview by the author with Harrison Hunt, Site visit , and a brochure.

⁴³ Richard Ryan, "Flour Milling Machinery and Operation At Saddle Rock Gristmill During The Mid 19th Century" (Nassau County Department of Recreation and Parks, 1991).

to the years 1833-1870 which were also the last full years of milling in Long Island. In those years the mill was also used as a terminal for the active shipping business with nearby New York. Small boats could dock right next to the building and could carry farm products from the Island to the city and bring back other goods.

The mill was owned by the same family from 1833 until 1950. In 1940 the family restored it to operative condition, in addition, an electric motor was installed to ensure a constant source of power for the mill's operation. In 1950 the family transferred the mill's deed to the Nassau County Historical Society which in 1955 transferred it to the Nassau County, Department of Recreation and Parks, Division of Museum Services. The County restored the mill into operative condition and reopened the mill to the public. The first time the mill was open was back in the 1960's, later it was closed and was reopened again to the public in October 1992 after completing massive work on its construction as well as installing a new wheel.

The mill location is in an upper class residential area, the site has an easy access from the road, but there are no other shops or other attractions for visitors in the area. The program is very basic and its main features are the wooden wheel, the gears (metal), the stones, and reproductions of Evans elevators. Although an effort was made to rebuild the wheel, the mill's spaces are empty as not many devices are on display, which create a lack of atmosphere and little is offered to the visitors.



Fig. 16 Saddle Rock Mill, metal gears are enclosed to avoid the entry of animals.

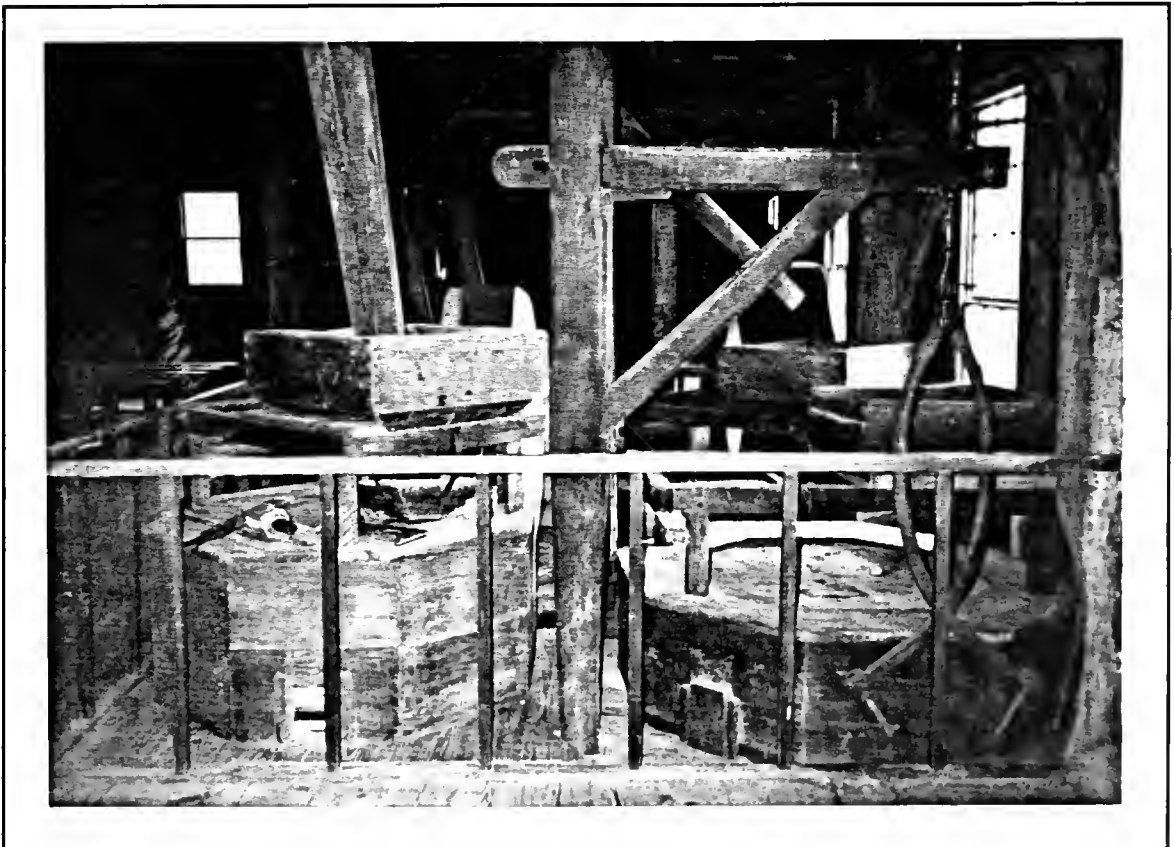


Fig. 17 Saddle Rock Mill, millstones with little machinery on the back.

The mill is open to the public on Saturdays during the summer and by appointment during the rest of the week. In its first year of operation it was visited by more than 500 people. The maintenance of a mill, unlike other historic residential houses, does not require the same level of attention to dust, heating, cooling, etc. Many of the expenses are incorporated through other County operations, so for example, carpentry is done by the county's carpenters saving the expense of hiring special teams to do the work.

Roslyn Grist Mill⁴⁴

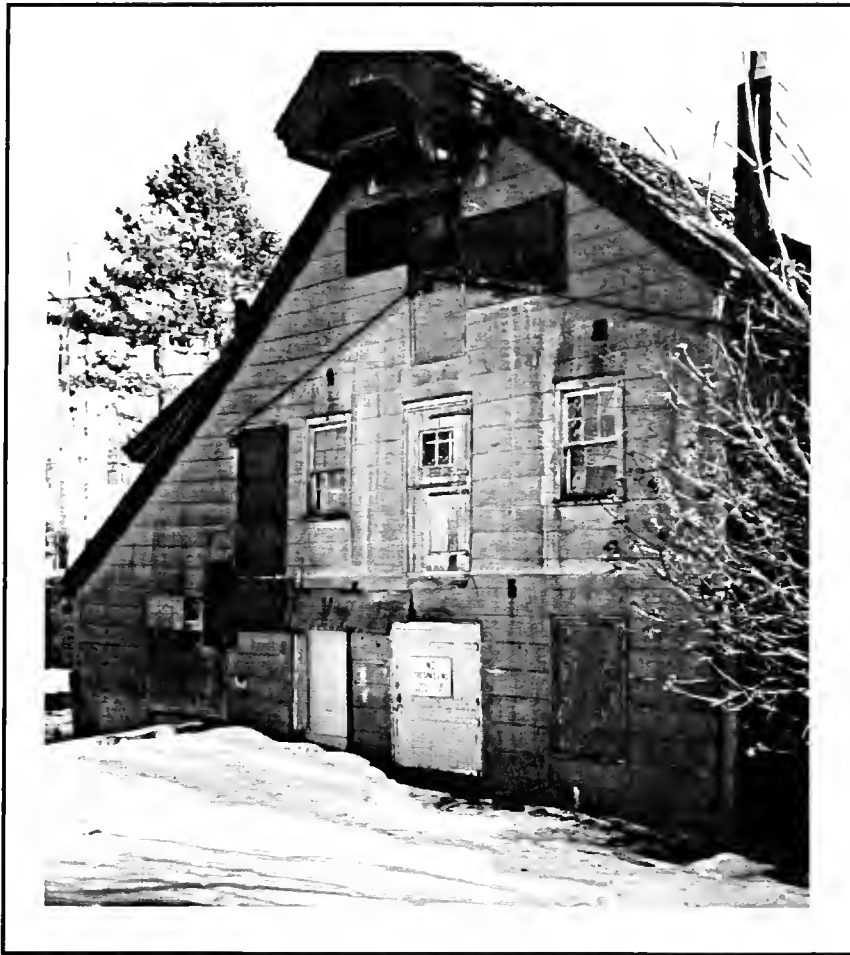


Fig. 18 Roslyn Mill, general view from the back. Advanced deterioration showing, as well as changes that were done to the facade.

This mill, a breastshot water operated grist mill, was built around 1715, is the earliest surviving example of a Dutch frame structure used for a mill. It is located on a dam with a pond which receives its water supply from a spring. The mill operated until about 1900.

⁴⁴ The information is based on an interview by the author with Harrison Hunt, and a site visit.

Today Roslyn has a historic district of which the mill is part. The mill's dam changed over the years into an important two way road with shops and many visitors. It is an attractive street not only for the Roslyn residents but for residents from the surrounding areas. This is an excellent location to open a mill for the public since, in addition to the mill there are many other sites to attract tourists.

In 1916 the mill underwent "restoration". The exterior walls were refinished with concrete shaped to look like wood and the floor of the second floor was also covered with concrete. The concrete additions onto the original structure add tremendous weight to the building, which resulted in severe deterioration and structural problems. After these changes were done, the mill was used as a restaurant and a tea house for about 50 years until the 1970's. The users of the building in those years installed many systems that otherwise would have never been introduced to the building (like furnace heating). Very little of the machinery is left, the wheel and the gears are gone together with the other parts of the equipment, and only part of the stones remain in place.

The County is considering massive restoration work on the building in order to open it to the public. Since the building has major construction problems as well as no milling machinery for exhibition, the County estimates the work needed to be done around \$750,000.

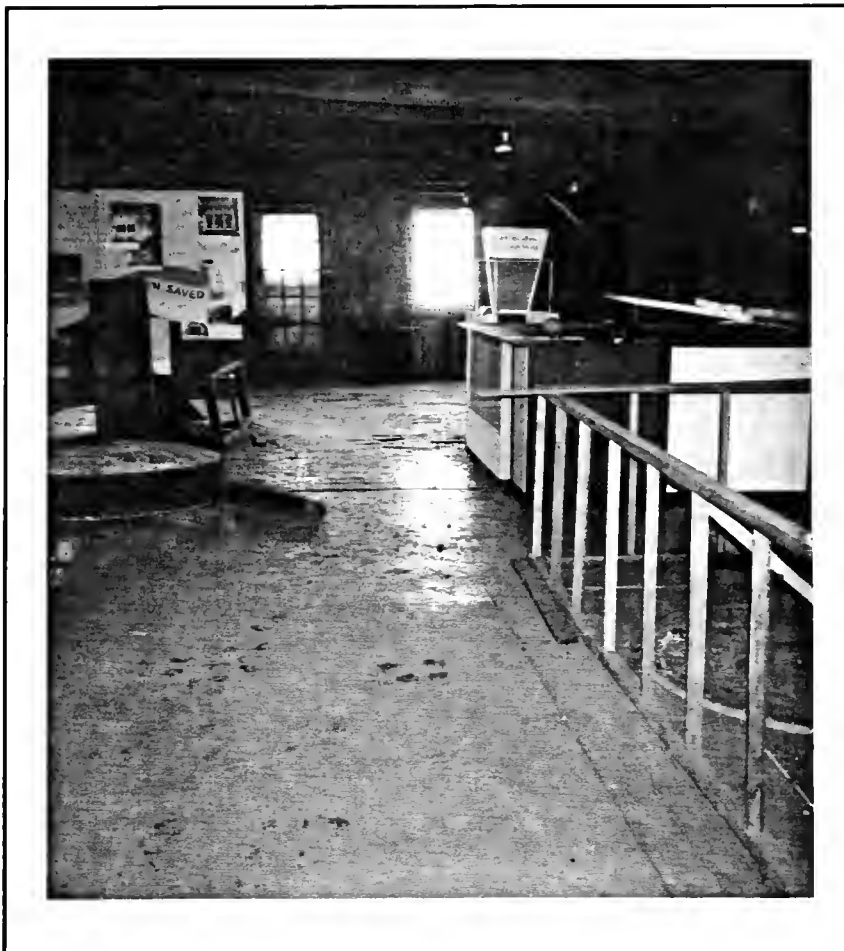


Fig 19 Interior of Roslyn mill.

Suffolk County

This is the eastern county of Long Island. More mills survived in Suffolk County compared with Nassau County probably due to lower population density. The surviving water operated mills are: Stony Brook, Blydenburgh Park, Connetquot Park, Water Mill,⁴⁵

⁴⁵ The mill in Water Mill was not visited by me, from other sources I have learned that in its atmosphere this mill is very much like the one in Stony Brook.

Head Of The River, Willow Pond⁴⁶ and, of course, Van Wyck Lefferts (in the town of Huntington).

Stony Brook⁴⁷



*Fig 20 Stony Brook Grist Mill, general view from the back.
(Mills' brochure)*

This is a breast shot water operated grist mill which very much like Roslyn Mill, is located on a dam by a pond that receives its water supply from a spring. The existing mill was built in the 1750's and replaced an earlier mill, which was built in 1699 and was destroyed when the mill dam broke around 1700. Some of the beams from the earlier mill

⁴⁶ Head of the River and Willow Pond are both located in Smithtown and are closed to the public. The first one is privately owned and the second one is located in Caleb Smith State Park. I did not visit either of them.

⁴⁷ The information is based on an interview by the author with Hap Barns, site visit, and brochures.

were used to build the structure of the later mill. The mill operated and produced flour mainly for mail orders until 1952, then it was given to the Museum of Stony Brook that kept it open until the 1970's. Then the mill was closed as it had badly deteriorated, and the ownership was passed to the Stony Brook Community Fund. Under their ownership restoration work started and lasted for three years, which resulted in the reopening of the mill to the public in July 1993. The preservation works were financed by grant and donations money, and have cost \$190,000 so far. The money was used to solve deterioration problems which included redoing the floors, fixing the deteriorated masonry wall (adjacent to the dam), attending to the machinery, setting up a gift shop etc. The project still requires additional \$100,000 to be completed.

Very much like the dam at Roslyn this one is also on a road. However, it is not as wide as the road in Roslyn and is not surrounded by stores, but still it provides excellent access to the site. It is off the main road and in an area that has other interesting historic buildings that are opened to the public. This tourist area attracts many visitors who can travel easily by car or foot between the mill and other historic sites. The mill is open for occasional visitors and organized tours all week except Mondays and Tuesdays, and since its opening last July it was toured by 4,000 visitors.

The building has two separate wings, one is the grist mill while the other used to be a saw mill. The saw mill had vats to store wine from the Island in the basement. In the past the site also accommodated another structure which operated as a wood working shop. This structure no longer exists and is believed to have been demolished at the turn

of the century. The mill is equipped with full working milling machinery equipment that includes interesting and unique devices. Because the mill was operating until the 1950's (which is considered very late) its machinery is not as old as the Lefferts Mill machinery. In its later days of operation it ground mainly corn and wheat, which were sold as a natural flour. In order to produce natural flour the bolters were hardly used as the customers wanted the natural article with the beneficial wheat germ.

The wheel is from the turn of the century. It is a metal cast wheel that was decorated with wood dressing to look like an old wooden wheel, which appears to be a very good solution for reducing the maintenance and expenses a real wooden wheel requires. The wheel is connected to the main shaft turning, today, the one pair of mill stones. The equipment includes many of Evans' devices (more than is on display in Roslyn). Very interesting features are the two bolting machines which are not found in many mills and are used to produce finer flour. In addition, other features were placed in the mill and those add interest to the visit, like a farm corn shucker that separates the corns kernels from the cob, and can be operated by children.⁴⁸ Then, the rest of the process is demonstrated to the visitors, taking them through the stages of grinding, sieving, and packing the product. In this mill one can get the full picture of the production of flour in a water operated grist mill.

⁴⁸ Originally the corn arrived at the mill already separated from the cob.

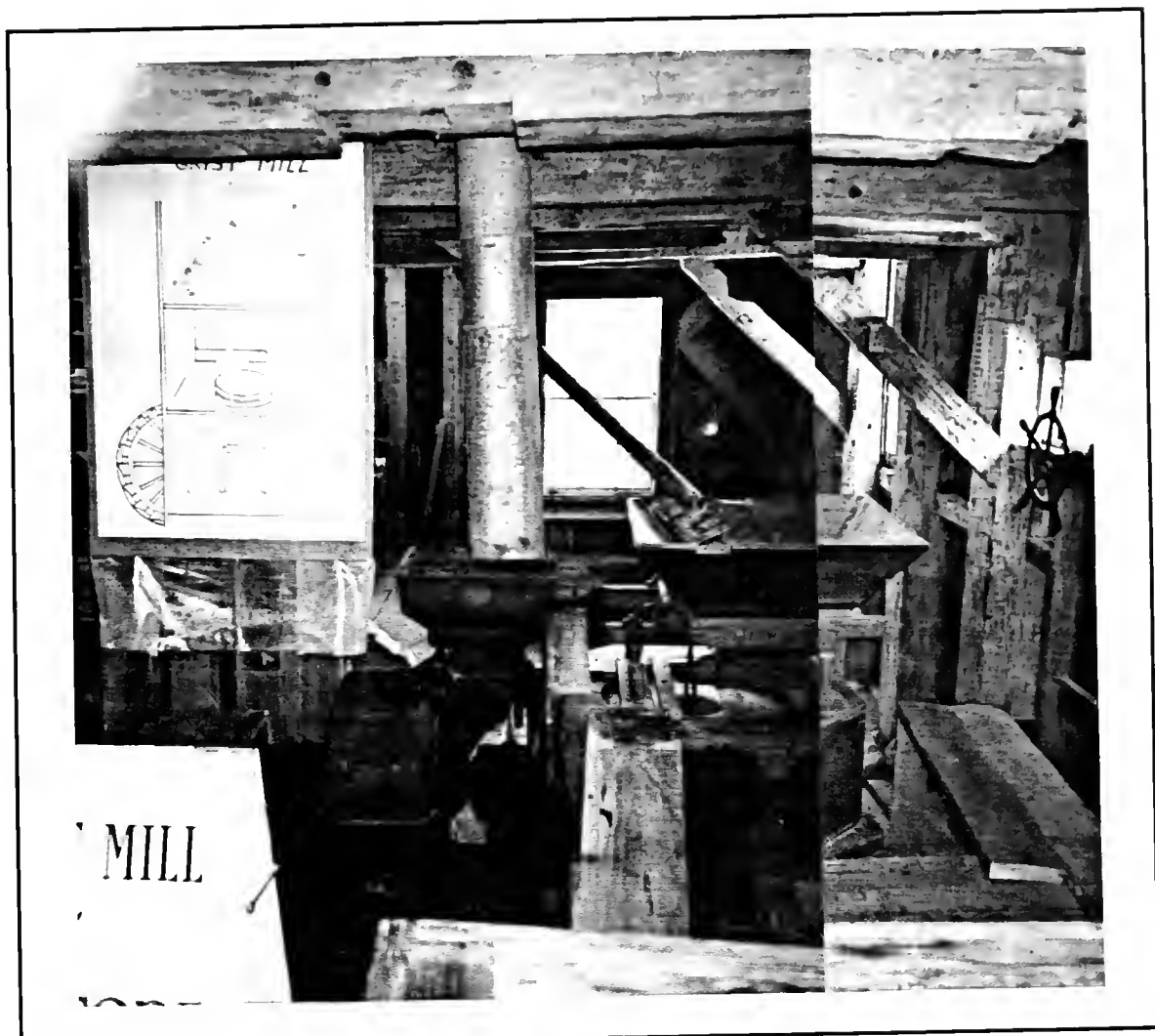


Fig 21 View of the millstones.

The mill has a small gift shop that sells literature and other goods related to the milling industry. I do not know the income this gift shop generates, but it turns the entrance level which is usually empty of machinery into a livelier space, even if not historically correct (for example in comparison with the Saddle Rock mill). The mill has a handicap entrance and the plan is to install video cameras and monitors so handicapped people can watch the operation from the entrance level. The building is equipped with a toilet that is very well concealed, and a simple heating system.

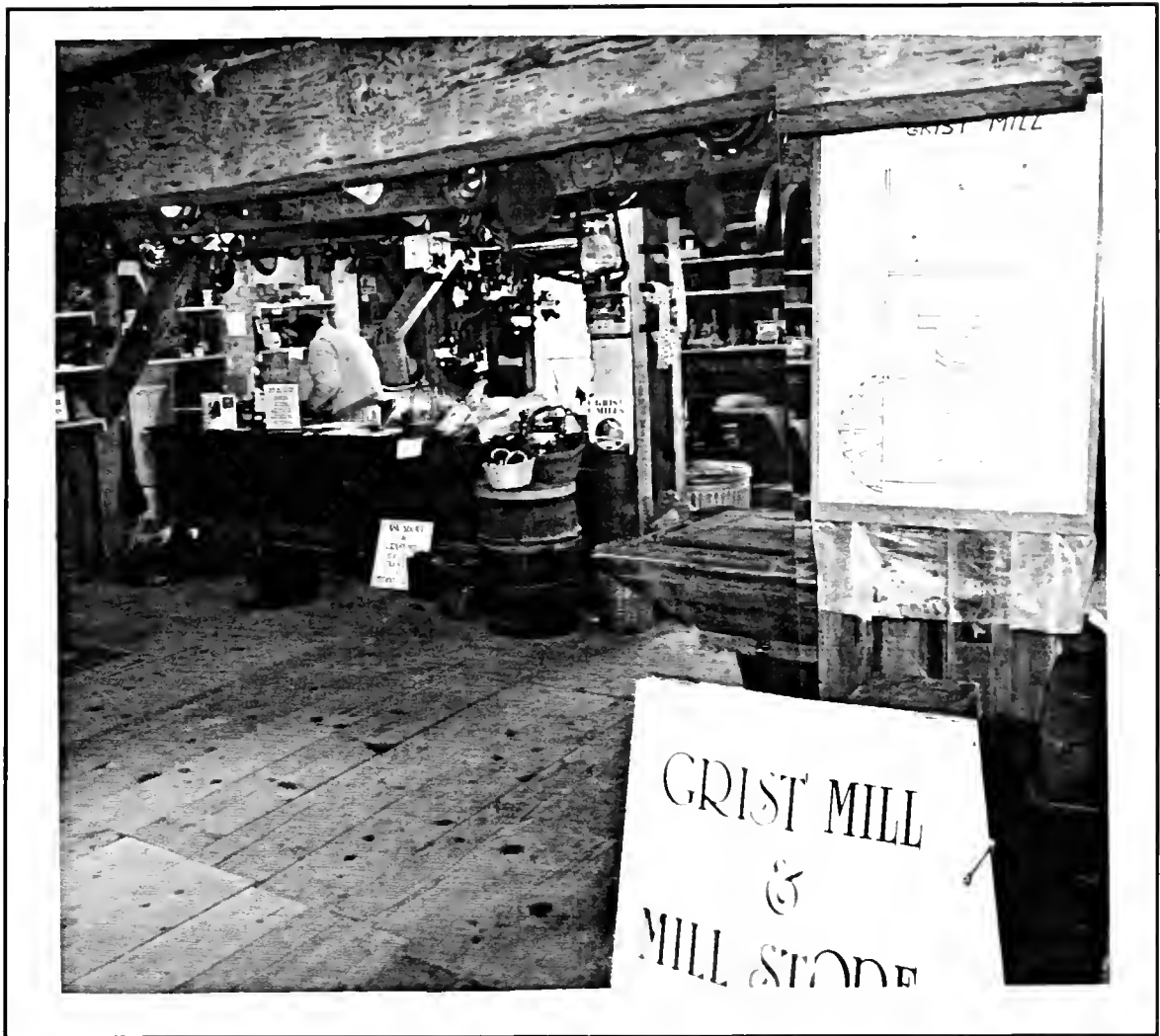


Fig 22 The gift shop

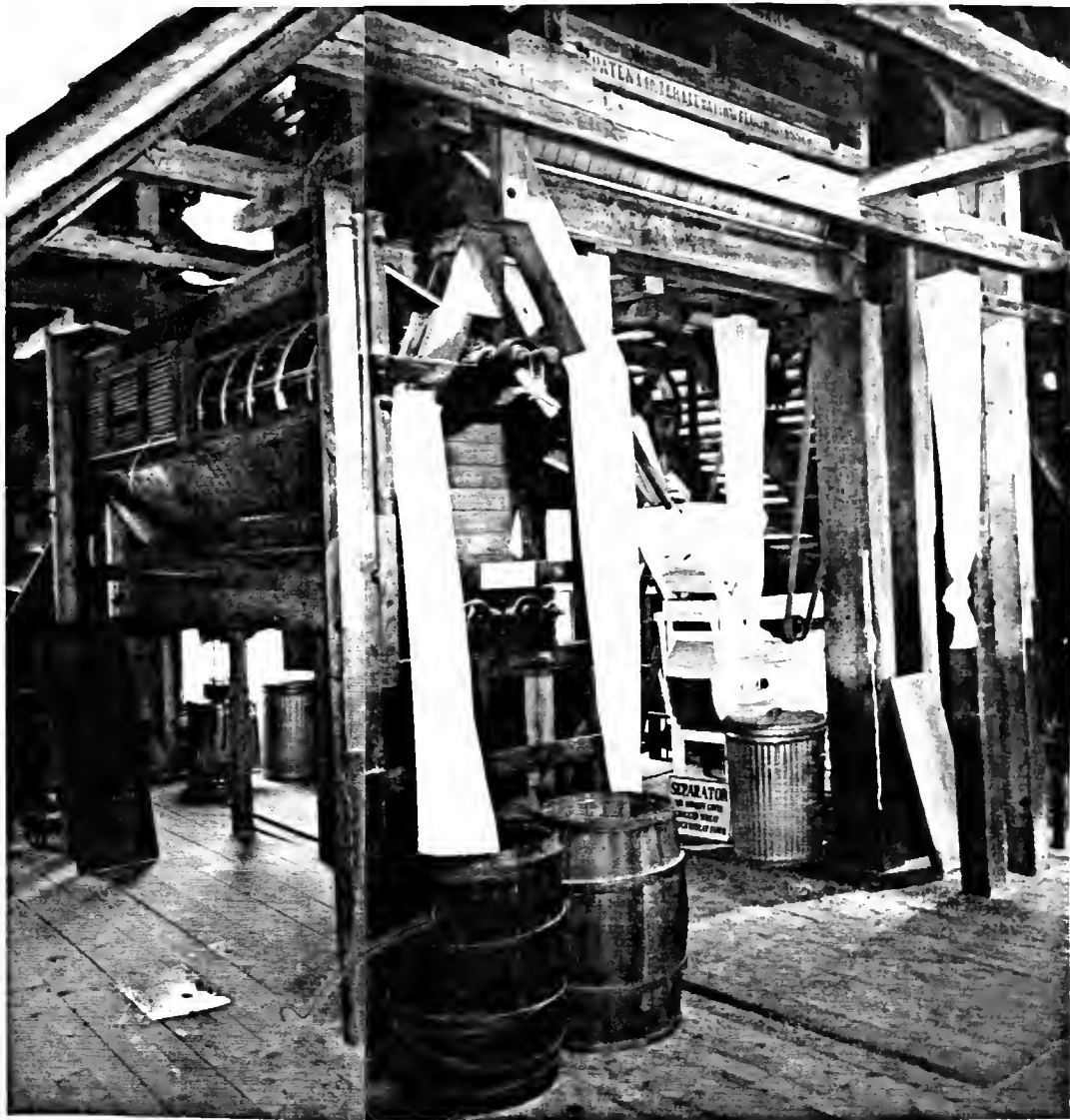


Fig 23 *The Bolting Machinery*

Ten years ago the adjacent saw mill was converted into an apartment and is rented, which provides income as well as being a “baby-sitter” to the mill. The basement of this part, which used to be a wine cellar, is used today as a mechanical room for the modern equipment (like heating system and more), as well as a storage space with access from both the apartment and the grist mill.

The New Mill in Blydenburgh Park.⁴⁹

This mill is owned by Suffolk County and is managed by the Department of Recreation Parks and Historic Preservation. It is currently undergoing a restoration program, and is expected to be open to the public after its completion.



Fig 24 The New Mill in Blydenburgh Park, general view.

The mill, built in 1798, is located on a dam with a pond which receives its water supply from a nearby stream. Originally the mill had two stories (basement and first floor), and around 1870 an additional floor was added. This change was performed by

⁴⁹ Information based on an interview by the author with Glance Mallano, a site visit, and a booklet about the mill.

cutting the roof, adding another floor, and reinstalling the roof frame. The reason for the addition was the transfer from water operation to steam roller machinery at this mill. The new equipment was added to the basement and to the second floor, and increased the mill's production capacity fourfold compared with the waterwheel. The miller's house remained on site, but two other mills that were on site as well are gone (a saw and a textile mill).

In its early days the mill had an overshot water wheel, located at the back of the structure. This wheel did not survive.

The county plan is to reinstall both the rollers and the water wheel to represent a period of about 10 years when both systems were in use (1870 -1878). Unfortunately, the original machinery of this mill is gone, except for the original turbines (part of the roller mill machinery) which were located in the basement. Even though they survived, they are badly rusted, and as a result can not operate any more and would only be used for display purposes. The county had acquired a full set of milling machinery from a mill in Maryland that was badly damaged by a hurricane. This machinery dates from the same time and is by the same manufacturer as was the original machinery. Original parts from the elevator system have survived as well.

The county is currently performing work to fix the mill in order to open it to the public. They foresee a similar type of program to the one offered in Stony Brook. Unlike the rest of the mills on the Island, this one will interpret the roller milling process, which

will make this mill unique and special as there are no other roller mills left on Long Island. The county also plans to open the miller's house (on the same site), and expects at least several thousand visitors annually.

The mill on the Connetquot River⁵⁰

This mill is owned by the Long Island State Park Commission and is located in Connetquot River Park. It was built between 1702 and 1751 on the bank of the river with a dam. The mill stopped operating at around 1878 and at the same time the Southside Sportsman's Club got possession of the mill. The club, a privately owned fishing club, closed the mill and left the machinery inside. In 1978 when the park ownership was passed to the Long Island State Park Region the mill was restored and opened to the public.

This mill is small compared with the other mills mentioned in this paper. It was operated by a horizontal wheel, which is a rare in this part of the country. The machinery in this mill, like in many others, was modified during its operating years but the drive mechanization was never changed. The mill has two sets of stones and used to have three tub/horizontal wheels, two of which operated the stones while the third operated other equipment. This wheel is similar to the early horizontal water wheel, except for the special circular enclosure (like a tub without a bottom) in which it operates. None of the original wheels were left in the mill, and the park commission decided not to reconstruct

⁵⁰ The information is based on an interview by the author with Gary Lawton, a site visit, and brochures.

them. As a result the millstones can not be operated and the mill does not demonstrate a process in action. Beside the stones and the gears it also has a bolting machine. The mill is not as interesting as the one in Stony Brook, however, the visitor can get a demonstration of the milling process within a small space and short time frame.

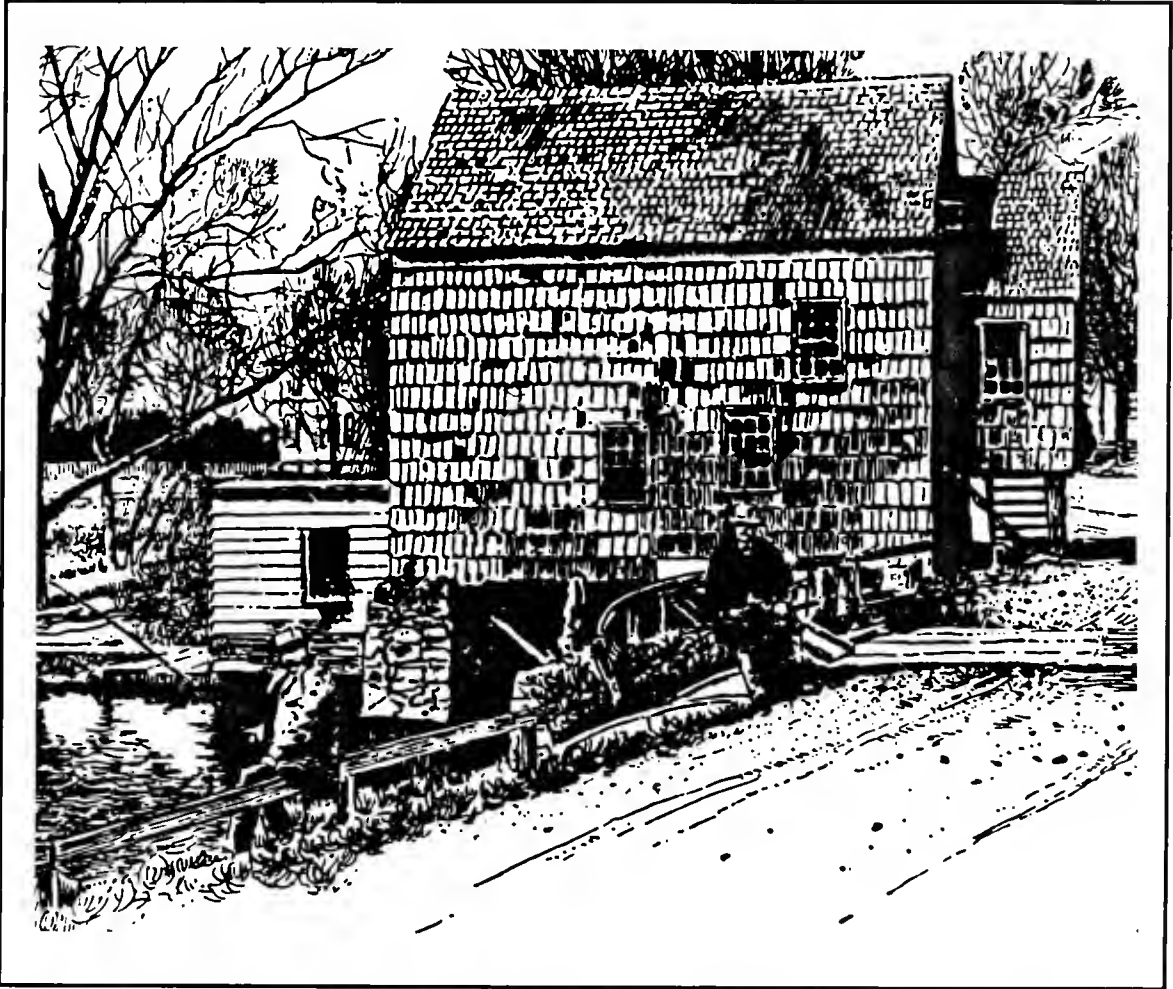


Fig 25 The mill on the Connetquot River, general view (from the mill's brochure)

Chapter 4

THE VAN WYCK LEFFERTS TIDE MILL



Fig 26 The Van Wyck Lefferts Tide Mill - southwest elevation.

History

The history of the Van Wyck Lefferts Tide Mill can be divided into three periods:

- The operational period from the time the mill was erected at the end of the 18th century until it ceased operating at the end of the 19th century.

- The period that the mill was owned by the DeClairville and the Schaick families, which tried to keep it in reasonable condition, until they passed the deeds to the Long Island Nature Conservancy at the second half of the 20th century.⁵¹
- The recent years, setting the stage for the future.

First Period: End of 18th Century to the End of the 19th Century

The property, which the mill dam and pond are part of, was purchased privately by Cole Wortman from John Sammis in 1793.⁵² Wortman was given a permit from the town to build a mill on the property, but received no land grant for it. According to the tax roles he never built the mill and in December 1793⁵³ sold the property to Van Wyck Senior and Junior.⁵⁴

The exact construction date of the mill is not clear, but when the deeds changed hands within the family on May 2, 1797, the gristmill was on it. For the next fifty years the mill was owned in shares, most of the time by four owners, except six years (between 1842 and 1850) when the mill was owned solely by the Lefferts family. This way of sharing the ownership of a mill to reduce the risk and raise capital for its operation, was common in Long Island.⁵⁵ Also see Appendix II for chain of title.⁵⁶

⁵¹ The family passed the deed of the mill in 1969, but they lived nearby until 1990.

⁵² For chain of title see Appendix II.

⁵³ For chain of title see Appendix II.

⁵⁴ All deeds are in the possession of the DeClairville family.

⁵⁵ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", footnote 10 on page 16.

Unfortunately, business records regarding the operation of the mill prior to 1860 did not survive which leaves us with an unclear picture of the way the mill operated at the end of the 18th century, and the first half of the 19th century. Even though no records exist prior to 1860, it seems that during that period the Lefferts mill was operating as a mercantile mill rather than a custom or country mill. The mill was privately owned, was not on a land grant from the town, and contained no stipulations which was the usual case with custom mills. In addition, Both Wortman and Van Wyck were wealthy and prominent landlords.⁵⁷ In the documents of the Federal Censuses,⁵⁸ Abraham Van Wyck Junior is identified as a farmer and not as a miller and both he and his father-in-law acted as bankers in the area. Therefore they were more likely to invest in a profitable venture. With this information one can only assume that people like that would not have built a mill to reap a profit of only 1/10 share of the final product.

By 1850 the value of the mill had declined. This was part of the changes taking place in the country and on the Island regarding the milling industry. According to Federal Censuses of Industry from 1860-1870 the mill was operating marginally. By 1870 the Lefferts mill was a custom mill charging 1/10 in toll, and was listed as being operated by one man. The records also show a decline in the share of Huntington's grain that the

⁵⁶ The chain of title was part of the HAER.

⁵⁷ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", 2.

⁵⁸ Federal Censuses information is from Christine M. Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", 3-7.

mill processed. In 1860 it processed around 7.8% of the wheat and corn grown in Huntington, while in 1870 it processed only around 2.7%.⁵⁹

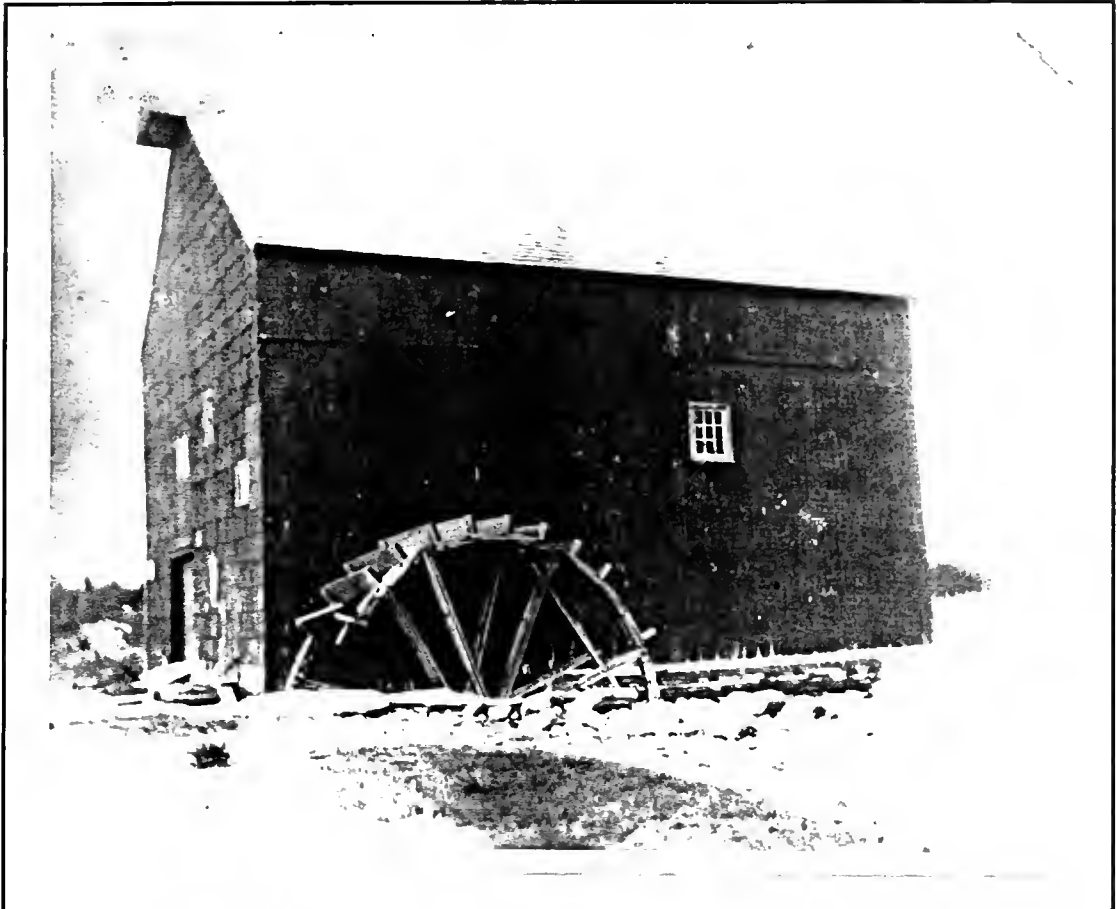


Fig. 27 The mill with its wheel still intact but badly damaged, southwest elevation. (HAER NY-106-19)

Lefferts mill could not compete with all the changes. After 1870 Jarvis Lefferts was not listed as a miller in the Federal Census of Industry (he passed away many years later in 1882). By 1880 the Lefferts mill was no longer listed in the Federal Census of Industry. From the available information, it is hard to know exactly when the mill was

⁵⁹ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", 6.

closed. It probably was closed sometime between 1870 -1890. Pictures from 1903 show the mill with its wheel still intact but badly damaged (Fig. 27).

One should think that the fact that the owners were not interested in upgrading the mill in the mid 19th century, was the first step toward the survival of the mill's original wooden machinery.

Second Period - End of 19th Century to the Second Half of the 20th Century

From the end of the 19th century to the second half of the 20th century the mill was owned by the DeClairville and the Schaick families.⁶⁰ Because they enjoyed the mill and probably appreciated its technology, the equipment was left in the mill, not all intact but in good condition (aside from the wheel that did not survive). Early in this century they still used to operate the mill a few times a year, by turning the wheel that was in place for the amusement of the children. Mrs. DeClairville, the last owner and the daughter of the person that owned the mill at the turn of the century, lived on the pond and as a child she remembered these seasonal operations. She inherited the property and lived in what was originally the miller's house on the pond. Later she and her husband moved to the top of the hill and her daughter moved into the house. In the 1960's Mr. and Mrs. DeClairville moved to Florida. Their daughter moved to the house on the hill and what was once the miller's house was sold. In 1969 Mr. and Mrs. DeClairville passed the deed of the property including the pond, dam, and mill to the Nature Conservancy Long Island

⁶⁰ For chain of title see Appendix II.

Chapter with an endowment for the maintenance and upkeeping of the dam and the mill. Even though they were no longer living on the property, they used to visit their daughter and had some contact with the mill. Two years ago when the daughter sold her house on the hill the second period, in which the mill did not operate but had private patrons looking after it from nearby, had ended.

Third Period From the Late 20th Century Onward

The third period is most probably the one that will determine the mill's future and if the building with its equipment will exist for the next generation to enjoy.

This mill has unique features that did not survive in any other mills in the United States. It is a beautiful example of the milling industry in this country and, especially, of Long Island's most prominent industry. These facts are well known, however, the future of the mill is unclear and in danger. This matter needs immediate attention, not only for the physical intervention but, even more important, for putting together a strategic plan encompassing all related aspects, as solving only a segment of the problem might not save this mill.

As of today the Nature Conservancy intends to start partial work on the site, utilizing the \$100,000 available, which will include as the first stage the stabilization of the foundations to prevent further deterioration of the structure. The Nature Conservancy has contracted the services of the Huntington Historical Society especially because of their qualified director Mr. Zack Studenroth. The Society will act as their agent in the process

of defining the scope of the project, assist the volunteering architects, review the bids and follow the execution of the project.

Site and Structure

The Site

The Van Wyck Lefferts Tide Mill was built on a man made earthen dam 400 feet long and between 20 to 30 feet wide (**Fig. 1**). The Huntington Harbor is to the east of the dam and Mill Cove Pond is to the west (see Appendix IV for site and harbor maps). The dam has two openings with gates; the tide gates to control the flow of water entering into the pond, and the sluice gate controlling the flow of water to the wheel.

The Structure

The building is an approximately 30 by 40 feet three story structure with a basement and an attic. The basement consists of unbounded stone walls and piers, the rest of the structure is wood, constructed of heavy timber column and beam frames, divided into bays (refer to Appendix IV for plans, elevations, sections, structural isometrics and drawings). The difference between the frame of a water gristmill and other industrial buildings is that the water mill has extra reinforcements of the timber work that support the mill stones and enclose the main gearing.

The first floor interior walls are very unique as they consist of half timbering with brick-infill (called also nogging). This was not found in other mills and it is hard to determine why was it done. One assumption for the use of the bricks⁶¹ was that they acted as an insulation on the floor where the grain flour was stored. The half-timbering which has various patterns on the different walls and is even less understood. Robert Howard from the Hagley Museum and Library⁶² assumed that the change in the pattern of the half timbering probably acted as a shock absorber for the vibration coming from the wheel and gears which are located on the southwest corner of the first floor. This approach can explain why the south and west walls, which are adjacent to that machinery, have a V shape pattern(Fig. 28), while the north and east walls, which are farther away from the machinery, have vertical and horizontal pattern (Fig. 29). Most of the bricks are not original to the building and in most cases are of unusual size and evidently sunbaked (Fig. 30).⁶³

⁶¹ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", 9.

⁶² Interviewed by me in December 93.

⁶³ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", 9.

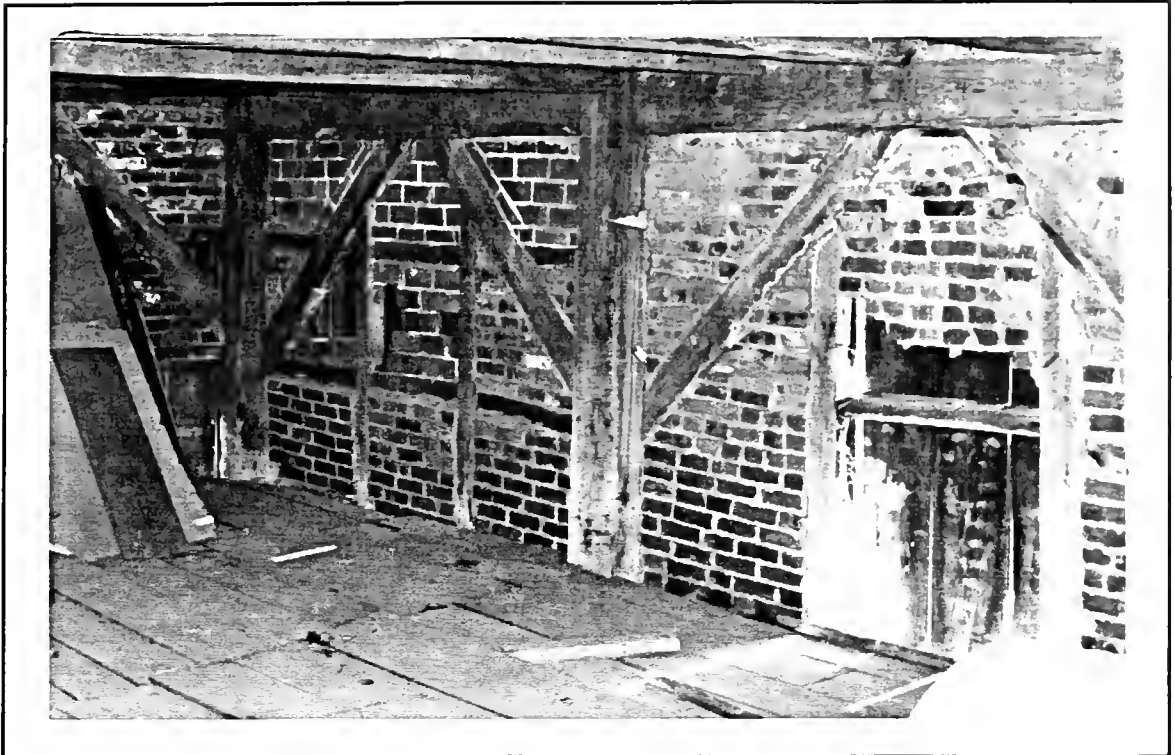


Fig. 28 V style half-timbering of the south wall.



Fig. 29 Horizontal and vertical half-timbering of the east wall.

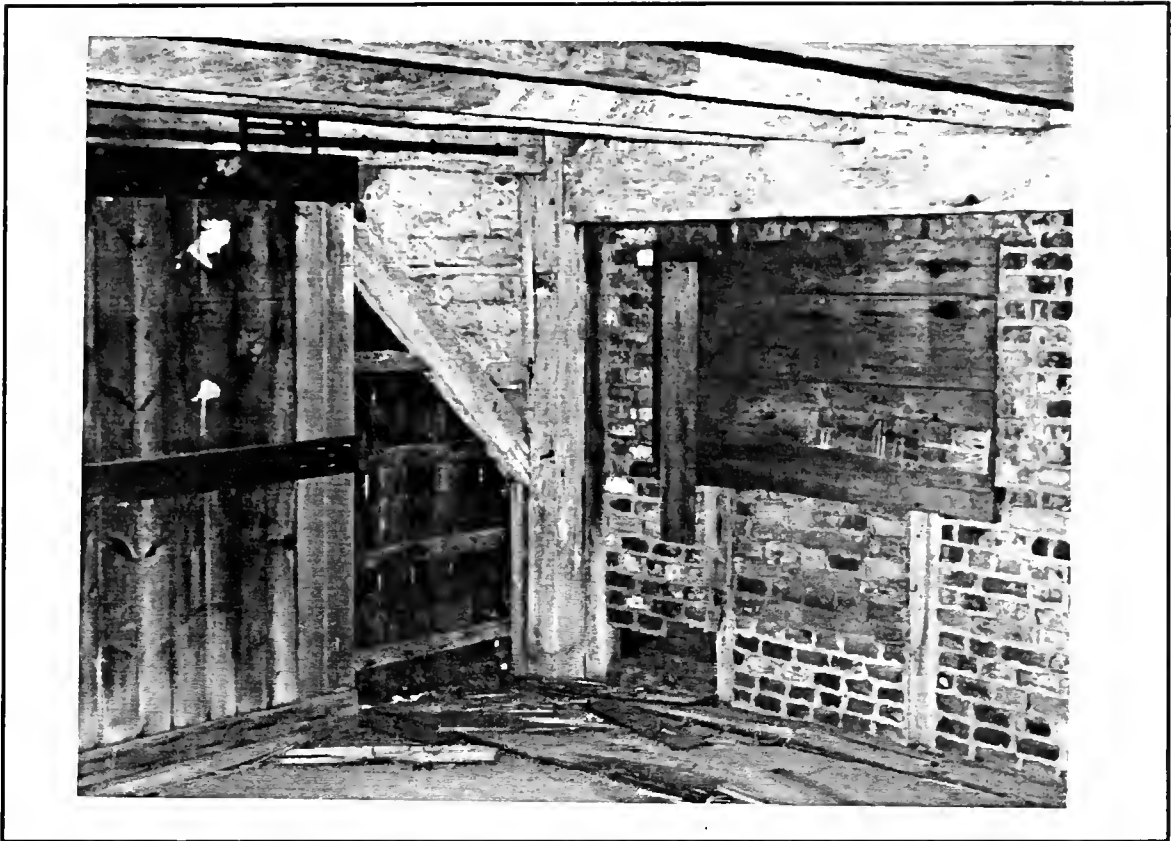


Fig. 30 Evidence of original sunbaked bricks, see north west corner where the bricks are white washed.

The timber joints in the buildings are mortise and tenon (see Appendix IV for structural isometrics). Some of the joints are quite complicated as they combine a number of separate pieces that have been joined together. Evidence implies that these complicated joints were assembled first on the ground, then the pieces were numbered, dismantled and were put together again in the right place according to the numbers. These Roman numerals can be found on the heavy timbers around the mill and testify to the technique used to assemble them.

Machinery

The mill's machinery is a rare example of that type of technology. In other surviving mills the wooden machinery was replaced and upgraded with metal parts, or the pieces were taken out of the mills when they stopped operating. The Lefferts Mill equipment is similar to other water grist mills of its type except for the water wheel and the tide gates. Most of the wooden machinery was left in the mill (Fig. 32 to Fig. 36), but not all intact and the water wheel has been gone for many years.

The tidal gates (Fig. 1, page 1) (12-15 feet wide) were top-hinged and swung to allow the tide water to enter the pond, and when the tide started to ebb, the pressure from the water accumulated in the pond shut the gates and held the water within the pond (the gates are in storage inside the mill). When the tide was low enough and created a sufficient head of water the sluice gate was opened. This gate, 8 feet wide, controlled the flow of water that operated the wheel. When it was opened water passed from the pond back into the harbor than the water struck the wheel at the bottom and the mill could be operated. The mill was operated twice daily for 5½ hours each time, until the water in the pond and in the harbor were level and the mill had to stop until the next ebbing tide.

The wheel together with the pit wheel were located in the cog pit, which were under the hursting (the timber framework which supports the mill stones and enclosed the main gearing). The pit wheel turned the first driven gear in the mill which is called a wallower (Fig. 31 and Fig. 33). Over the wallower is the super wheel, which was meshed

into three other gears. These three gears are called 'lantern pinion gears'. Two of them are called 'stone nuts' and are responsible to drive the mill stone. The third gear is connected to the 'crown wheel' and is responsible for driving the auxiliary equipment. The stone nuts have two slip cogs that can be removed to stop these gears from operating. Each stone nut has a shaft that is connected to the lower milling stone (called 'bedstone'). When the stone nut and the stone spindle turned, they caused the runnerstone to revolve, while the upper stone was stationary. The height of the stone nut also determined the distance between the bed stones and the runner stone, thereby controlling the thickness of the flour.

The third lantern pinion which was responsible for the other equipment in the mill is connected to a large vertical auxiliary shaft that goes up through the second and third floors. In each floor it was meshed into wheels that powered the machinery on that floor.

That large shaft is not original to the 1795 construction, but the original was most probably similar. On the second floor that shaft transmitted power to the crown wheel (Fig. 35) which was responsible for the operation of the bolter (machine that sifted flour into separate grades), and another three small overhead shafts, the purposes of which were not determined. The screener to sift debris from the grain before it was ground was on that same floor. On the third floor the large shaft powered a smutter (removed a fungal growth called smut from the wheat), which spun the wheat in high speed against a rough surface, so the smut was scraped from the grain and then thrown through a blower. The grains which were heavier fell into a garner waiting to be ground (The smutter was an

invention of the second half of the 19th century). On the third floor was another small screener.

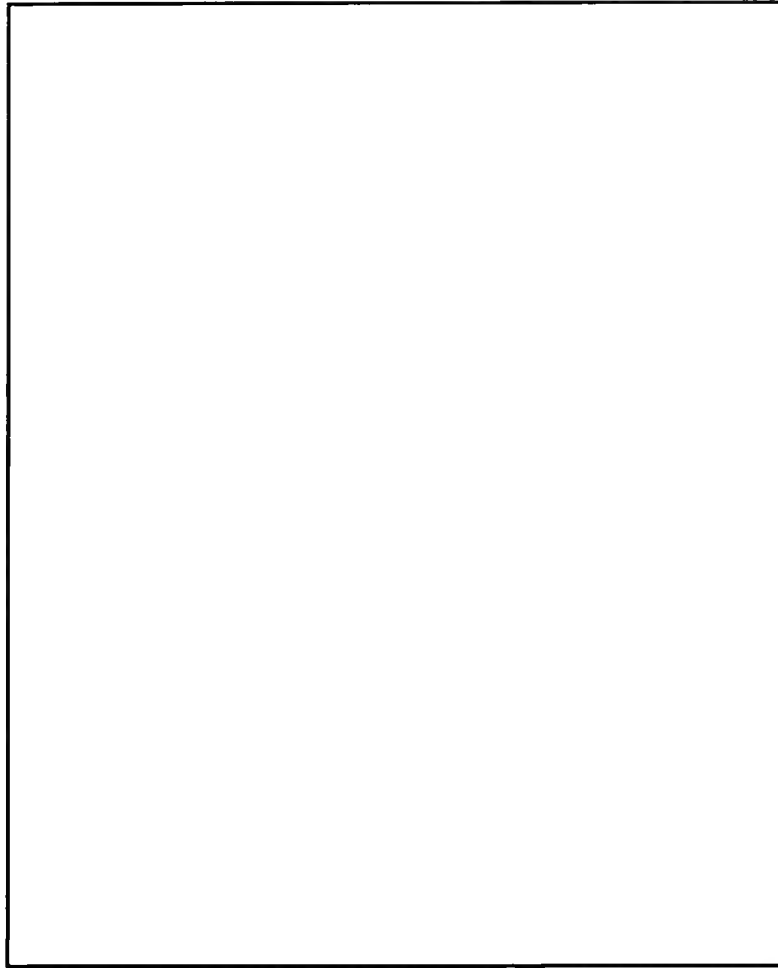


Fig. 31 Isometric view of the wooden gearing. The surviving gearing is shown in darker lines. (HAER)

The mill had cup elevators (Oliver Evans' invention) in operation. It is unclear when the elevators were installed, but it was assumed (based on physical evidence found in the mill)⁶⁴ that a cup elevator that was left in the mill is a second generation, and followed

⁶⁴ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey".

a system using leather buckets larger than the small metal cups that were found in the mill. The mill also used Archimedean screws which operated horizontally to transport materials from one place to the other on the same floor (invented by Oliver Evans). These devices are in the mill but not intact (Fig. 36).

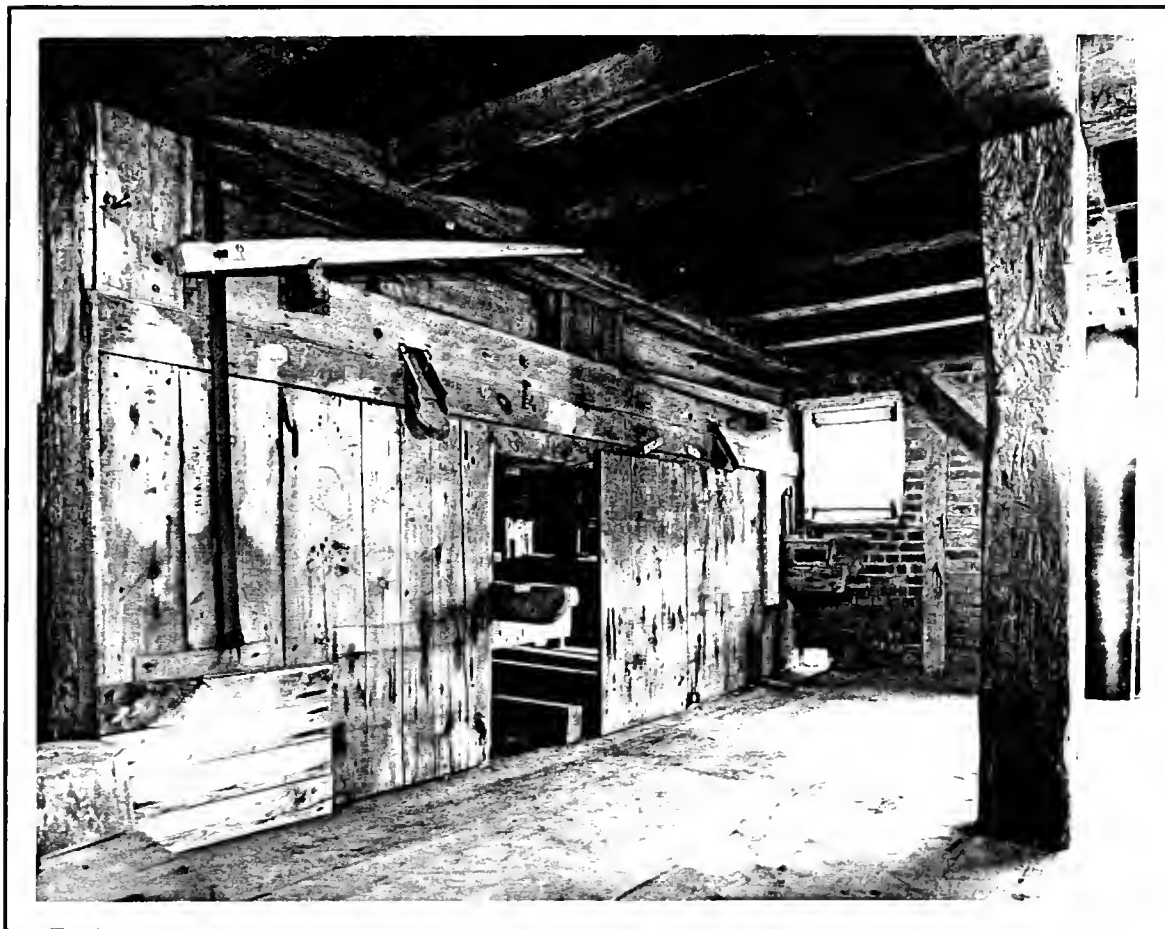


Fig. 32 Interior view of southwest corner, with the enclosed gears. The mechanism controlling the distance between the stones is operated by the lever in the top left corner. (HAER NY-106-11)

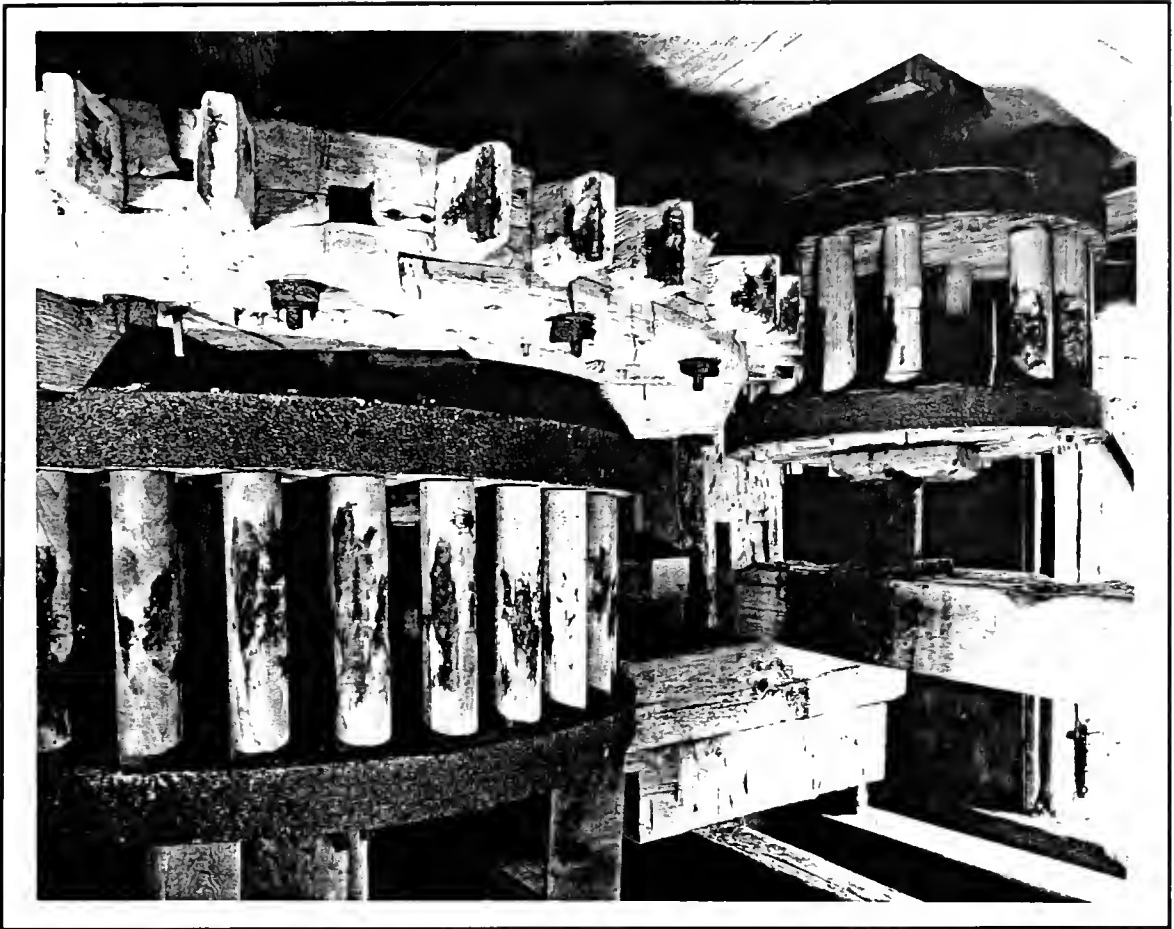
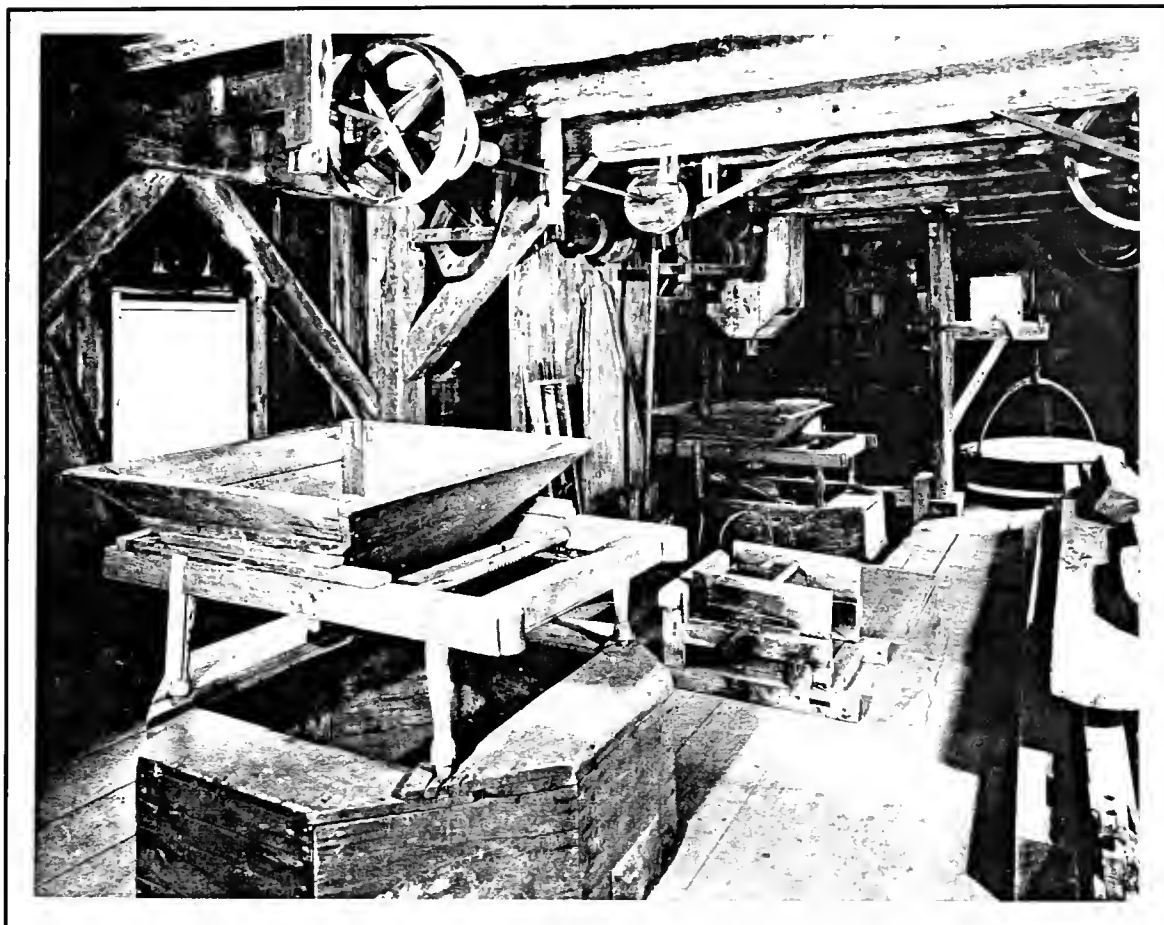


Fig. 33 Inside the cog pit; great spur wheel and wallower on left, auxiliary pinion on right. (HAER NY-106-13)



*Fig. 34 Interior, second floor, looking southwest. Stone, hopper, horse, crane with runner stone (on the right).
(HAER NY-106-6)*

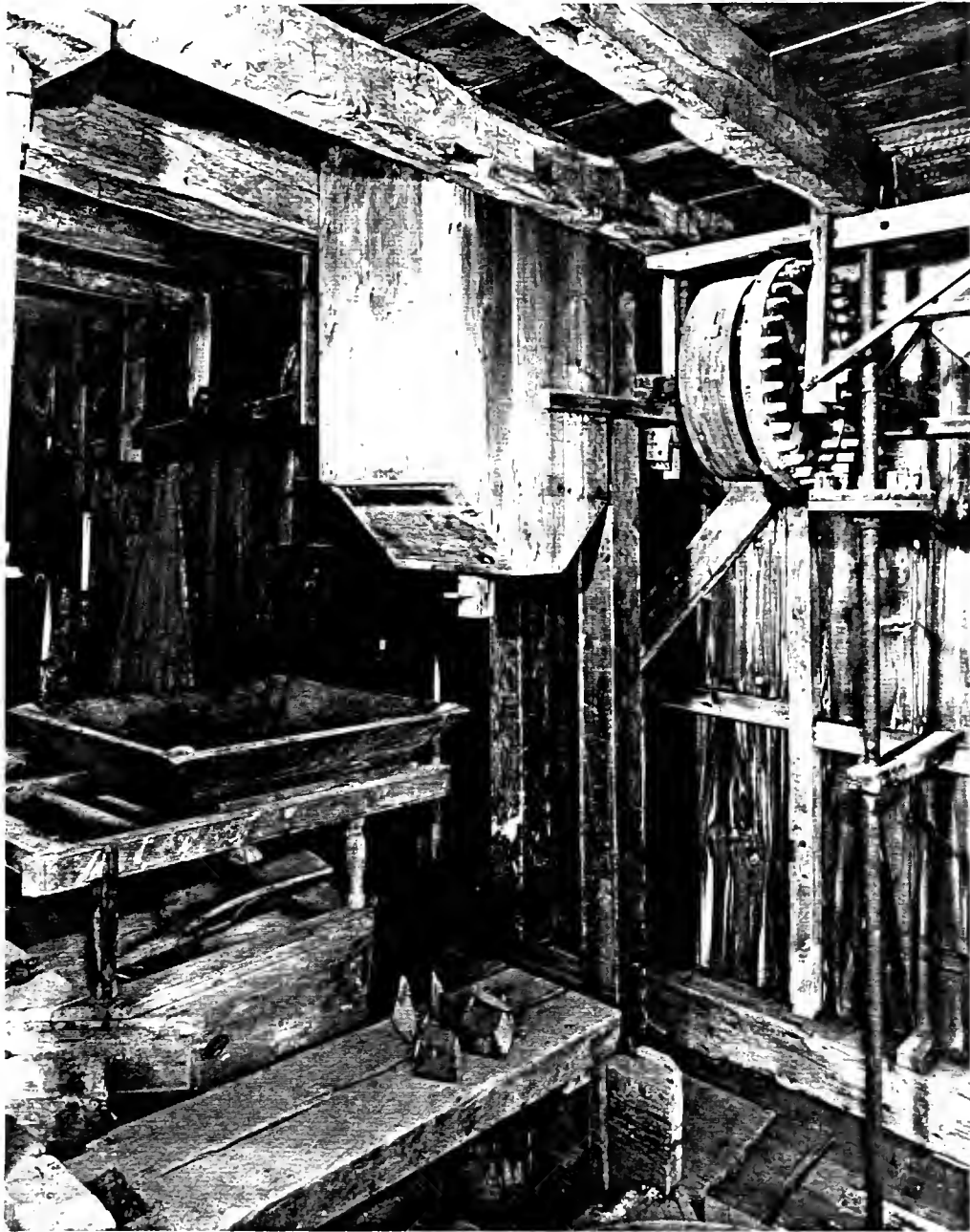


Fig. 35 Second floor: Stone with hopper and horse on the left; Garner and remaining cups from the elevator in the center; crown wheel on the right. (HAER NY-106-08)

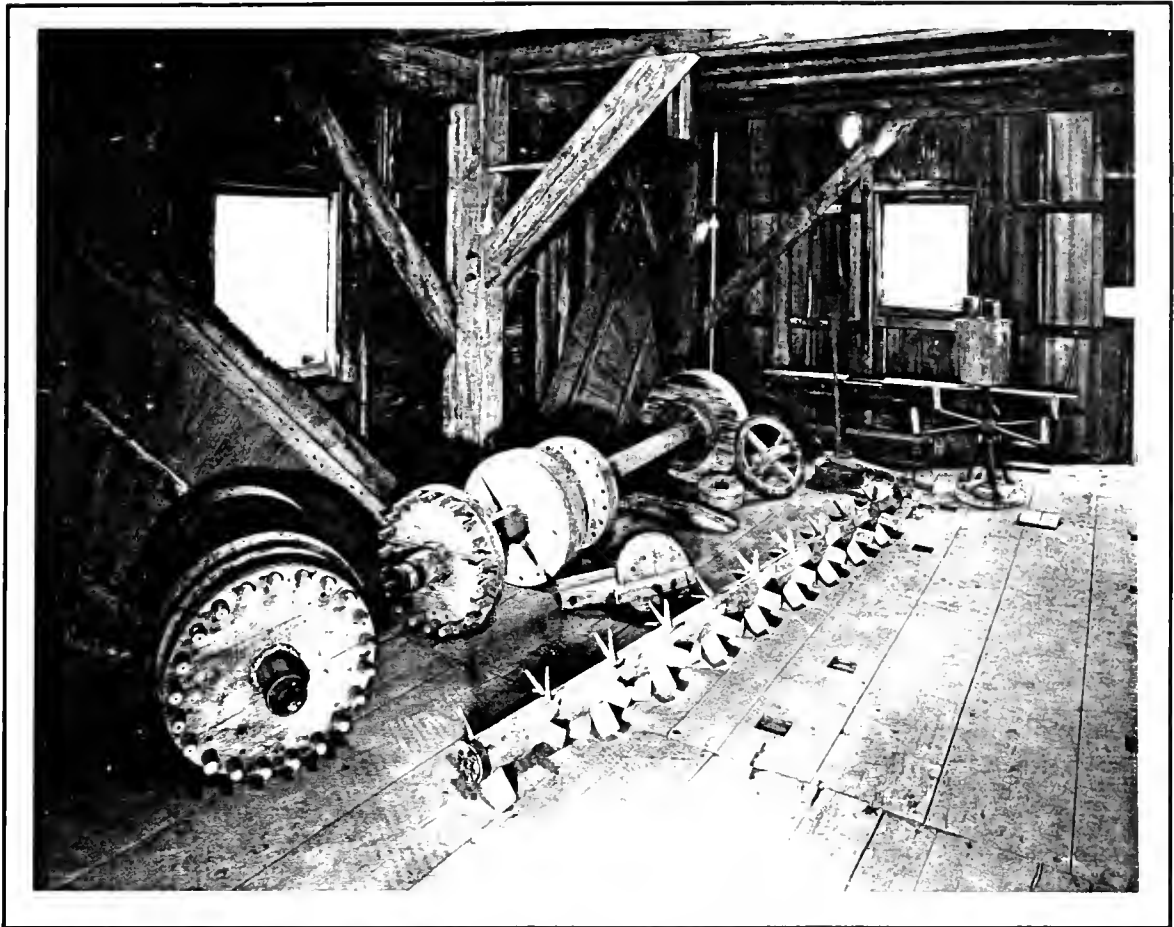


Fig. 36 Second floor, loose machinery: shafts, and a conveyer (HAER NY-106-10)

Deterioration

Van Wyck Lefferts Tide Mill is located in salt water and is subject to severe weather conditions, in addition, most of the mill's structure (except the basement) is made out of wood. These factors contributed to the rapid deterioration of the various components, with some components in critical condition, endangering the future of the structure.

Foundations and Structural Problems

Since they are located in the basement level they were not accessible and were not inspected by me. The report on this part of the building is based on information made available to me by Huntington Historical Society and by HAER document as well as physical evidence on the first floor.

The basement is constructed with unbound stone walls and piers.⁶⁵ The piers are falling apart, putting the whole structure at risk. Traces of the problem can be inspected looking at the first floor which is bowing (Fig. 37). The problem was already attended to unsuccessfully back in 1984, and therefore have to be attended to again. Realizing the danger to the building, the Nature Conservancy made it the first priority to be fixed (by the Huntington Historical Society) as soon as the work begins.

On the ground level there is a concrete lintel, supporting the mill's south wall (located between the basement's wall and the wood structure above), which is also falling apart.

⁶⁵ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", 8.



Fig. 37 Bowing first floor.

The timber frame structure inside the building seems to be in a fairly good condition.

Exterior

The exterior of the building is very simple and has no special ornaments. In many places the wood siding is in an advanced deteriorated condition (Fig. 38). The poor condition of the wood allows water to enter the building from in between the timber siding and from the window's frames joints (the windows are shut). This accelerated the deterioration of the interior surfaces.

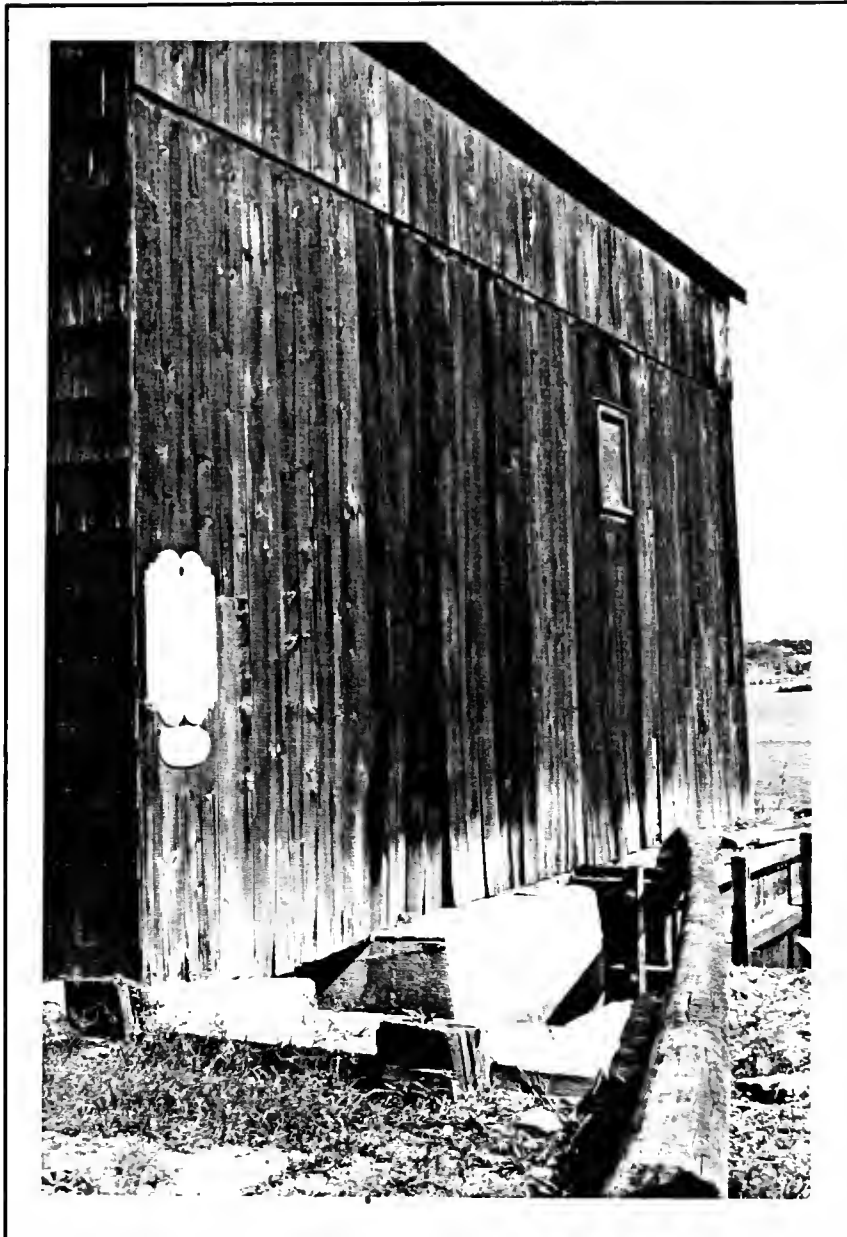


Fig. 38 Badly deteriorated wood sidings, south elevations. Also notice the original location for the water wheel.

The roof is in a good condition as it was replaced recently and gives good protection to the building.

Interior

Most of the interior deterioration problems are caused by water leaks. The brick nogging on the first floor (covering the interior walls), a most unique feature of this mill, is badly damaged. The constant access of water to the bricks causes the formation of the efflorescent, which many bricks suffer from (Fig. 39). The damage caused by the efflorescent is far beyond the loss of the bricks' fire skin as many bricks have large holes in them while others are practically falling apart. Residue can be found on the floors around the walls. The only way to prevent this from expanding is to stop the "supply" of water to the bricks. There is no insulation between the wood siding, and some of the pieces of the siding were detached from the structure and were never finished with any waterproof coating. This condition allows free access for the water to get into the building.

One can assume that the replacement of bricks was part of the routine maintenance of the mill, as the bricks come in various sizes,⁶⁶ and one can only assume that they are from different periods, with only few of them considered original (Fig. 30).

Another matter that can accelerate the deterioration of the bricks is the repointing that they underwent. Here again, the pointing of the bricks varies in color and in thickness which indicates that repointing was performed at different times. In many places it seems that the mortar is made out of cement which is most probably harder than the sunbaked bricks (Fig. 39). This is very likely to damage the fragile bricks even further. The worst

⁶⁶ Daniels, "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey", 9.

deteriorated bricks were found on the north and south walls. Other than that the building is dry inside and needs extensive carpentry work to get it into good shape.⁶⁷



Fig. 39 Efflorescence on the bricks of the north wall.

⁶⁷ No HSR (historical structure report) was ever done on the building, I believe that is an important matter to attend to especially if and when the building goes through a complete preservation and restoration program.

Chapter 5

ALTERNATIVES FOR INTERPRETATION

This chapter discusses problems related to the interpretation program of the site, and brings up suggestions for various solutions.

The proper strategy that will be taken towards this special site will determine its future, as this site has a unique set of problems with which most historic properties are not faced. It is important to try and examine the whole picture as one piece and not to relate to each segment or component separately, as solving only one of the problems will not lead to a long term comprehensive solution.

Preliminary Problems and Basic Facts

The problems and facts presented here have to be understood and taken into account before suggesting any solutions, as they determine the limitations, advantages and disadvantages of the site, the building, and the owner.

- The site is surrounded by private properties with no right of way from the main road (see maps in Appendix IV). As of today, the neighbors allow the Nature Conservancy and the Huntington Historical Society access to the site through their properties for maintenance and repair work. In the near future the only way to bring visitors to the site on a regular basis is via water. A group located in the

marina of Huntington Harbor is willing to transfer materials during the restoration period and occasionally some visitors on a voluntary basis.

- The nature conservancy, as the site owner, has the responsibility to manage and take care of the property. One should realize that the Conservancy as an organization does not interpret historic resources in the same way historical societies do not deal with open land. They do not have the interest nor the proper staff to deal with the task of interpreting a historic site.
- The property has an endowment of about \$60,000 created by the DeClairville family when they transferred the deeds of the property to the Nature Conservancy. The money is to be used for the maintenance and repairs of the mill and dam. It is possible that the family will endow more money in the future.
- As of today no voluntary group, like 'the friends of the mill', has been established to promote, raise more money, and bring attention and support for the mill.
- Donations and state money: The State, realizing the importance of this site, awarded the mill a grant, matching every dollar raised by the Conservancy with a dollar grant money up to the sum of \$50,000. The Conservancy managed to raise \$50,000 in donations from the neighbors around the pond (which shows their positive attitude), and together with the State money they already have \$100,000 for the restoration of the mill (all with almost no public relations). The State gave the money on the condition that the mill will be open to visitors 12 times a year.

At the same time the state understands that the mill is located in an inaccessible site and, therefore, the money is primarily to save the mill rather than to open it to the public. Hence they (according to the Conservancy) do not expect an ambitious interpretation program.

- The conservancy would like to spend the available \$100,000 on restoring the foundations and the concrete beam as well as fixing the exterior wood siding.
- In order to complete a full scale interpretation program additional money would be required.
- The building has no connection to modern mechanical systems (i.e. electrical, water, sewer etc.). The neighbors in the adjacent properties have agreed to let the Nature Conservancy take the needed lines through their properties.
- The building is subject to severe weather conditions, and will always need a great deal of attention and maintenance.

I believe that the major problems of this property are both the ownership and the right of way. I think that the access problem is less complicated than it appears to be at the first glance, as a water access solution could be turned into an advantage. For the reasons I discussed above the project does not receive the attention it requires, attention which it might receive from a different owner whose focus is on buildings rather than on open land.

The Options For the Interpretation of the Site

Off Site Programs - General

1. Relocation of the mill, with complete restoration on an alternative site.
2. The mill, dam, and machinery to be fully documented, the machinery to be removed and the building to remain on the site for alternative uses.

On Site Programs - General

3. The mill to undergo minimal and necessary repairs and to be closed to the public.
4. The mill to undergo medium scale restoration in order to lease it to another organization that will operate and maintain it, and keep it open to the public.
5. Between (3) and (4) above there are numerous possibilities.
6. Transferring the ownership to another organization that can better accommodate the rehabilitation and long term operation of the mill.
7. Renting the building on a seasonal basis.

Off Site Programs - Details

1. Relocation and Full Interpretation Program

Realizing the importance of the mill and its machinery, the whole structure and its contents would be moved to a more accessible and maintainable site. This solution will preserve the mill, although outside the original context, for future generations.

The benefits are safe utilization of the available money, the access to new donations (due to a more promising site), right of way to maintain the building and bring visitors. This can take the big burden from the Nature Conservancy.

The main disadvantages are: locating an appropriate site both in terms of system compatibility (like tide water, pond, etc.) and with owners that can undertake such a project.

Relocation also removes the mill from its original and natural context, which is part of the mill's structure, machinery, and existence. One must remember that both the pond and the dam would not exist if not for the mill, and a relocation can not achieve such reproduction of the environment.

2. Full Documentation And Relocating the Machinery

Since the interpretation of the site is difficult, and since the current deterioration of the mill poses danger to its existence, one solution is to fully document the dam, mill, and machinery. Then remove all the machinery, and find an alternative use for the structure.

Unlike the relocation of the whole mill, this idea suggests to separate the mill from its contents which will result in using the available money in a safe way. The machinery could be removed and reconstructed in another “home”, like another mill that has no machinery (Roslyn Mill for example), or, alternatively, in a museum. The documentation would allow the construction of a professionally detailed diorama in the future. Regarding the structure, one can give it back to the neighbors to use as a shared facility (party or guest house), with the condition that they will maintain it.

This proposal also leaves the option, slim as it is, that the machinery will be put back into the structure sometime in the future (in the case it would be stored in a museum).

On Site Programs - Details

The on-site programs are based on the notion that the mill remains in its current location, and some level of intervention is applied:

3. *Repairing, Stabilizing and Closing the Building to the Public*

Under this program minimal repairs that would stabilize the building and prevent further deterioration from taking place are suggested. The mill will remain closed to the public until more funds and access to the site are provided. The objective is to invest a minimal amount of money and effort and keep the option of a full scale restoration for a later time.

The main drawback of this solution is the little improvement it brings to the current situation, and the fact that in a few years we would face the same problems we are facing now. No obvious change in the ability to restore the building is expected within the next few years.

4. *Stabilizing the Building and Leasing the Mill to Another Organization to Develop and Run a Program for the General Public*

Under this proposal, the best possible restoration under the current budget would be performed, then the assets would be leased to another organization (specializing in the operation of historical sites)⁶⁸ that would complete repairs and operate the mill (including opening it to the public). The organization to be selected should have better skills and experience in managing historic sites.

Boats may be used to gain access to the site, and a reasonable flow of tourists may justify construction of a small dock near the mill. Since access to the mill, without special docks, is only possible during high tide, access to the site would be by appointment only. That would restrict the amount of visitors, but also reduce the expense of operating the mill on a daily basis. Arriving on the site from the water would be a unique feature that adds both charm and authenticity to the program as it represents a common way people gained access to water mills in the past.

⁶⁸ Possible candidates are SPLIA (Society for Long Island Antiquity) and the Huntington Historical Society.

This suggestion has a few drawbacks. First there is a need for much more capital than is currently available. Although once the program starts it would be easier to raise additional money (in case it will be a good program) for its continued operation. However the funds needed to bring it to that point are not available⁶⁹. Another related problem is the scale and complexity of operating and gaining access to the mill which many smaller organizations would not undertake.

5. *Between 3 and 4*

One can envision other solutions between (3) and (4) above, since both include a similar first stage (some restoration of the structure). An example of a midway solution would be shared responsibility, where more than one organization operates the asset. This would probably result in a better budget, but lower placement of the mill in the hierarchy of importance for each organization. It can also raise many problems regarding the different responsibilities of the involved organizations.

6. *Transferring ownership*

Since the scale of the project is beyond the scope of interest of the Nature Conservancy they should consider passing the deed to another organization which could better deal with the asset. One candidate is Suffolk County, which has a large infrastructure to support large projects, and uses synergy with other projects to lower the

⁶⁹ The NY State Office of Parks and Historic Preservation compiled a list of possible sources of funds available for projects in the field of historic preservation.

costs. For example they already employ craftsmen and carpenters, which work at other sites. The county can also raise capital, and promote the project both to the public and through their network of schools and other organizations, which would create the initial flow of visitors.

The interview with Mr. Glance Mallano⁷⁰ from the Suffolk County Department of Recreation Parks and Historic Preservation brought to my attention that the county owns an estate on the Huntington Harbor. This estate overlooks the Van Wyck Lefferts Tide Mill, and includes a dock, parking and toilet facilities which can be used as a departure point to the mill and eliminate the need to use the marina. Mr. Mallano added that the county will be most interested in looking into owning the Lefferts Mill, as the county is currently restoring a mill in Blydenburgh Park (page 43) so they are already involved in the field of mill restoration. They will look favorably upon owning the mill together with its endowment and the \$100,000 available today, and will undertake to raise the required additional money to restore the mill, and to open it to the public.

Mr. Mallano raised another interesting suggestion. His idea is to get together several mill owners on Long Island in order to hire of a full time millwright person who can take care of several mills. This person is not expected to open and operate the mills for the public (that can be done by volunteers of each organization), but to attend to the problems regarding the buildings and the machinery and keep them in good operating

⁷⁰ Suffolk County- Manager of Historic Buildings; Dep. of Recreation Parks and Historic Preservation.

condition. Since the mills need constant maintenance by knowledgeable operators but at the same time it is too expensive to hire a millwright person for each site, such an idea can provide better maintenance at a lower cost. Mr. Mallano added that by organizing the mills under a single program (maybe operating them on an alternating schedules) one can classify the project as a regional approach to Long Island's history, which would allow more funding and better support.

In order for the conservancy to transfer the deed to the county they should require the following conditions:

- A written suggestion for a complete restoration program should be handed to the Nature Conservancy prior to transferring the property.
- The County should establish a "Friends Group for the Mill" which can manage the special money raised for this project. If a group like that does not exist the money will be put into the general pool of money under the County and can not be separated for specific use. If that happened the money might be channeled to other uses in the County and the whole effect of transferring the ownership will diminish

7. *Renting*

Renting part of a historic structure in order to both generate income and to have the asset maintained and looked after is a common practice in the field of historic preservation. The first floor of the mill can be rented during the warmer part of the year, as it provides a large open space, without machinery (except the enclosed gears on the NE

corner, Fig. 32). The tenant would be able to show the building to selected visitors, if the need arises.

The main problem with that solution is the need to connect the building to modern mechanical systems, like electricity, sewer and water. This solution also requires the agreement of the neighbors to give the right of way to the tenants.

Technical and Program Issues

Any complete interpretation program would require certain modifications to the site. Such modifications include toilets, electricity, handicapped access and wheel reconstruction. Other issues that arise from such a program relate to the nature of the operating organization, and the relation to other sites. I detail below some of the topics that must be addressed while developing the program.⁷¹

Technical Issues

An interpretation program that will include either visitors (on a regular basis) or a tenant, would require the following installations:

Toilet / Sewage / Water supply

Toilet should be available on site. A chemical toilet can easily be installed and save the work and expense of placing a sewer line. The toilet can be placed on the first floor

⁷¹ The subjects are organized by nature, and not by order of importance.

around the corner where the main gears are located. As this floor is empty it should be relatively easy to enclose a small space for this purpose (as was done in Stony Brook). It is also possible to have a small structure on the other end of the dam to accommodate a toilet. Water connection is relatively simple, and can be accomplished by running a pipe to the nearest neighbor.

Electricity

Electrical supply to the site is a requirement. It is needed primarily for lighting and security, but also for other tasks (like video monitors for the handicapped, multimedia presentations, etc.). The conservative way to supply electrical power is to be connected to LILCO, establishing the connection is estimated to cost about \$15,000.⁷² However, one may introduce alternative energy sources, such as water or sun, which may be cheaper and more appropriate, especially in light of the grants and loans available to explore such solutions (see Appendix III)⁷³.

Hydro Electrical Power

Many homes located in rural and isolated areas around the country generate their electricity supply from water energy. This energy can be stored in batteries and can be used for the operation of house appliances and other power related items. In cases where

⁷² A figure given to me by the Huntington Historical Society.

⁷³ I interviewed Mr. Mark Kapner, from the NY Power Authority regarding those matters. He is responsible for research, support and promotion of renewable energy usage, mainly solar and hydro-energy for home usage.

the head of water is low (like in a tidal mill) the system that is used is a small scale hydro-electrical power. The assumption is that if the available head of the water can turn the wheel, it can certainly generate electric power. This unit has to be custom designed and its main components will be a turbine, shaft, generator and batteries, making it capable of generating about 200W. As the energy will accumulate in batteries the current that will be available is a direct current (in contrast with the indirect current that is used in most homes). This power can be changed into indirect current with the help of a special device, or will require the use of special electric appliances that can be connected to direct current, like the ones inside recreation vehicles. The batteries accumulate power which can later be used when no head of water is available to generate electricity.

One of the beauties of this system is that both the mill and the small hydro electrical machinery generates the energy from the same source. This idea can definitely be part of the exhibition in the mill to demonstrate modern application of water energy side by side with the traditional ones.

Solar Energy

Another source of energy can be a solar cell system. As an example, a private house can receive half of its electrical consumption from a 10'×10' rack of solar cells located 100 feet away from the house if needed. The electrical consumption for the mill is considerably low compared with a household, therefore it should possible to generate all

its electrical supply in this way. A rough estimation for such installation is \$10,000 and maybe less.⁷⁴

Funds and Loans for Renewable Energy Projects

The NY Power Authorities help finance projects like that by providing low interest loans, and with special grants if they find a project interesting for research. Mr. Kapner indicated that they might be interested in conducting a research involving a small scale hydro-electrical power system in a location like the Lefferts Tide Mill, and he said he would be interested in getting further details about the project. Such cooperation can obviously save money, and may also provide a cheap source of electricity.

The NY State Research and Development Authority is another organization that provides funds in cases where the application will involve an innovative exhibition. Alternative power sources can fit into the program offered in the mill to the visitors and it can be most interesting to demonstrate both the historic and modern ways to use water energy.

Handicapped Access

If proper access will be made from a dock to the building, handicapped people can easily gain access the first floor. It is possible to place video cameras at the different

⁷⁴ I did not conduct a market research. Additional information on the related industry is included in Appendix III.

floors and have a monitor at the first floor that allows people to view the mill operation without going upstairs. A similar installation is planned in the Stony Brook mill.

Program Issues

The Water Wheel

Since the water wheel is missing, the program provider must decide for or against reconstruction of such a wheel. The Conservancy claims that such reconstruction is expensive and would require frequent maintenance, and this is probably true for a wooden wheel. However, in the mill at Stony Brook it was proved that this is not the only solution, and they used a metal wheel from the turn of the century and finished it with wood to make it look like the original one. It reduced the costs of maintenance, and although it is not a perfect reconstruction, it is a good practical solution that makes that site very attractive, as the functionality and the look are very authentic. It is clear that the wheel is a key success factor of such a program as the whole site is based on a combination of a building that is a machine, and what makes this machine exist is the water wheel. One can omit some parts of the machinery and the mill could still operate, but without the wheel it can not happen. This is also the only part of the machine visible from the outside, not reconstructing it would make the mill look like another old forgotten barn.

The Nature Conservancy

The current plan of the Nature Conservancy is a three stage one:

- a. To stabilize the structure, and to replace the wood siding with the available funds.
- b. With the help of their staff that include no professionals in milling, to put some of the machinery back together, and to arrange a basic exhibition program that would include homemade posters.
- c. Open the mill for a limited amount of visitors, on a trial basis.

Only if all three stages are complete, and interest in the mill looks promising, would they consider raising more money for a complete program.

The Conservancy will be more than happy to lease the property to another organization or combine several organizations to operate the mill together.

The Nature Conservancy estimates a full interpretation program including a new wheel at about \$1 million. This figure seems to be too high in comparison to other mill programs which show much lower figures. For example, the Roslyn Mill, which is in a more advanced state of deterioration condition and has no machinery, is estimated at \$700,000 and the mill in Stony Brook which had comparable deterioration problems cost until now only \$190,000 and requires additional \$100,000 to add final items to the program.

Chapter 6

CONCLUSIONS AND SUGGESTIONS

The Van Wyck Lefferts Tide Mill is a unique mill, with original wood machinery, which requires immediate attention. There are decisions to be made and implemented, and those require some further studies and reports. A more technical report, covering the following should be assembled:

- Cost analysis for complete restoration and preservation work on the mill (except the machinery) and the cost of operating the mill on a continues basis.
- Engineer report, done by a milling expert like Robert Howard from the Hagley Museum and Library, that estimates the cost and time required to reassemble the machinery, including the manufacturing or purchasing of missing parts.
- Anticipated number of visitors per year.
- Sources of funds to support the program.

Such a report could support a decision regarding the future of the mill, from taking on a full restoration, to just minimal work. Other important issues that the current owners must consider are:

- *Ownership* - I was led to believe that the mill may fit better with Suffolk County than with the Nature Conservancy. The county has better resources to tackle the

restoration, the long term maintenance and operation of the site. Not only that but it is also within their scope and interest.

- *Operation* - The Lefferts mill is not the last mill in the county, and in terms of visitors it faces competition from other restored sites. In order to attract visitors the program implementation must be comprehensive and well planned. I believe that the conservancy's suggestion to promote full restoration of the site only *after* and on the basis of its limited rehabilitation success is doomed to fail. With partial restoration, partial program and no wheel to operate the machinery visitors most probably will prefer to spend their time at an alternative mill. If full restoration is based on the visitor flow and their enjoyment, I do not believe full restoration in this case ever will take place.
- *The wheel* - As I mentioned before, the wheel is an integral and key part of the machinery of the mill, not only that, a mill can not operate without it. It is the only external indication that the site is a mill. Restoring it, in my opinion, is vital to the success of a program that includes visitors to the site.
- *Program* - In case the mill will not be operated by the Nature Conservancy, one should try and combine the indoor programs offered inside the mill with program involving the outdoor natural area. Maybe the Conservancy can set up a program which can add uniqueness to the visit.

Unfortunately, the current situation, both in terms of funds and ownership is not promising. If transferring the deed to another organization would not be possible, the mill would probably face minimal restoration to keep it from falling apart, and the machinery might be moved to another location.

Appendix I

NAMES, ADDRESSES AND PHONE NUMBERS OF INDIVIDUALS AND ORGANIZATIONS INTERVIEWED BY THE AUTHOR

Hap Barns - Facilities Manager, Stony Brook Community Fund. 111 Main Street,
Stony Brook NY 11034. Phone: 516-7512244

Lori Hampton - Field Representative, The New York State Office of Parks,
Recreation and Historic Preservation, Historic Preservation Field Services Bureau,
Long Island Region. Belmont Lake Park, P.O. Box 247, Babylon, New York
11702-0247. Phone: 516-6691000.

Robert Howard - Curator of Industry and Technology, Haygley Museum And Library.
298 Buck Road, Wilmington, DE 19807. Phone: 302-6582401.

Lloyd Hoffsteter - Energy Technical Specialist II New York State Energy Office.
Two Rockefeller Plaza, Albany, NY 12223. Phone: 518-4744995.

Harrison Hunt - Division of Museum Services, Nassau County Department of
Recreation and Parks. Phone: 516-4636417.

Mark Kapner - Manager Of Conservation And Alternative Energy, New York Power
Authority. 1633 Broadway, New York, NY 10019. Phone: 212-4686725

Christopher Kennett - An individual not connected to any organization that did research work on the milling industry in the country. Involving both wind and water mills. Mr. Kenneth is also a video photographer, and he documented part of the mills (including many mills on the Island) with this media. Mr. Kenneth has a Ph.D. in Behavioral Evolutionary Ecology from Fordham University. 179 Country Road, Demarest, NJ 07627. Phone: 201-7846070.

Eleanor Knapp - Manager Of Education And Museum Operation, Haygley Museum And Library. 209 Buck Road, Wilmington, DE, 19807. Phone: 302-6582401.

Gary Lowton - Conservation Educator, Connetquot River State Park, New York State Office Of Parks Recreation & Historic Preservation, Long Island State Park Region. Belmont Lake State Park, P.O. Box 247, Babylon, NY 11702. Phone: 5811005.

Bruce Lund - Director of Preserves, The Nature Conservancy, Long Island Chapter. 250 Lawrence Hill Road, Cold Spring Harbor, NY 11724. Phone: 516-3673225.

Glance Mallano - Director of Historic Services, Suffolk County Department of Park, Recreation, and Conservation. Belmont Lake State Park, P.O. Box 247, Babylon, NY 11702. Phone: 516-6691000.

Zachary N. Studenroth - Director of the Huntington Historical Society. 209 Main Street, Huntington, NY 11743. Phone: 516-4277045.

Appendix II

CHAIN OF TITLE⁷⁵

The following is an incomplete chain of title to the land whereon the Van Wyck (Lefferts) Tide Mill now stands, and to the mill itself. Reference is to the County Clerk's Office for Suffolk County, Riverhead, and to documents in the possession of Gwendolyn Gwynne DeClairville.

1793	1793 Entry in Huntington Tax Rolls. Land only. Coles Wortman to Abraham Van Wyck and son-in-law, Abraham Van Wyck. 280 pounds.
1797	Deed 2 May 1797 recorded in Liber D, page 217. Title for one-half the grist mill and appurtenances. Abraham Van Wyck Senior to Abraham Van Wyck Junior. 250 pounds.
1798	Deed 5 May 1798 in the possession of G. G. DeClairville. Title for one-half of the grist mill and appurtenances. Also one-half of the twenty acre lot in West Neck whereon it stood and one-half of one other piece of land in Cold Spring Harbor that totaled six and one-half acres. Abraham Van Wyck Junior to Samuel and Henry Lefferts. 2150 dollars.
1802	Deed 2 March 1802 in the possession of G. G. DeClairville. Title for one-quarter of the grist mill, one-quarter of the mill lot, and one-quarter the land in Cold Spring Harbor. John Slessor to Daniel Whitehead Kissam. 1280 dollars.
1830	Deed 28 October 1830 recorded in Liber 33, page 183. Title for one-quarter of the grist mill, one-quarter of the mill lot, and one-quarter of the land in Cold Spring. Jonathan and Elizabeth Smith to Daniel Whitehead Kissam. 1800 dollars.
1839	Deed 12 June 1839 in the possession of G. G. DeClairville. Also recorded in Liber 253, page 175. Title for one-quarter of the grist mill, one-quarter of the mill lot, and one-quarter of the land in Cold Spring. Daniel Whitehead Kissam to Sarah and Phebe Sammis. One dollar.

⁷⁵ This Appendix is an exact reproduction from HAER, NY-106.

1842	Deed 30 April 1842 in the possession of G. G. DeClairville. Also recorded in Liber 233, page 35. Title for one-quarter of the grist mill, one-quarter of the mill lot, and one-quarter of the land in Cold Spring. Samuel and William Kissam, executors for Daniel Whitehead Kissam to Jarvis Lefferts. 652 dollars.
1842	Deed 25 May 1842 in the possession of G. G. DeClairville. Also recorded in Liber 253, page 178. Title for one-quarter of the grist mill, one-quarter of the mill lot and one-quarter of the land in Cold Spring. Anna Lefferts (widow of Samuel Lefferts); and Martha Lefferts (only child and heir of Samuel Lefferts) to Henry Lefferts. 1010 dollars.
1844	Will June 1844, executed November 1844. Recorded in Will Liber 4, page 289. Letters Liber 8, page 30. One-quarter of the grist mill, mill lot and land in Cold Spring. Henry Lefferts to Jarvis Lefferts (Son).
1844	Will June 1844, executed November 1844. Recorded in Will Liber 4, page 289. Letters Liber 8, page 30. One-quarter of the grist mill, mill lot and land in Cold Spring. Henry Lefferts to John and Theodore Lefferts (grandsons, minor children of John Lefferts, deceased. Jarvis Lefferts, guardian).
1844	Deed December 1844 in the possession of G. G. DeClairville. Also recorded in Liber 100, page 439. Title for one-quarter of the grist mill, one-quarter of the mill lot, and one-quarter of land in Cold Spring. Phebe Sammis and Sarah Sammis to Jarvis Lefferts, miller. 675 dollars.
1850	Deed 30 September 1850 in the possession of G. G. DeClairville. Title for one-quarter of the grist mill "called Lefferts Mill", one-quarter of the mill lot, and one-quarter of the land in Cold Spring. John and Theodore Lefferts to Jarvis Lefferts. 1300 dollars.
1882	Deed 3 July 1882 in the possession of G. G. DeClairville, also recorded in Liber 265, page 499. Title for the entire grist mill and mill lot. Ebenezer C. Lefferts and Julia A. Sammis, heirs of Jarvis Lefferts, Melissa A. Lefferts, wife of Ebenezer Lefferts, and Sarah A. Lefferts, widow of Jarvis Lefferts to Willard A. Sammis. One dollar.
1886	Deed 5 April 1886 in the possession of G. G. DeClairville. Title for the entire mill and mill lot. Willard W. Sammis and wife, Phebe, to Jenkins Van Schaick of New York City. 5000 dollars.
1893	Deed 1 July 1893. Recorded in Liber 399, page 533. Title for the grist mill and mill lot. Jenkins Van Schaick and Maria Van Schaick to Gertrude M. Van Schaick, wife of John B. Van Schtick.
1926	Deed 22 January 1926. Recorded in Liber 1168, page 518. Gertrude M. Wombwell (formerly Van Schaick) to Mildred Van Schaick Gwynne. Mildred Van Schaick Gwynne to Gwendolyn Gwynne DeClairville, by will.
1969	Deed 30 December 1969. Recorded in Liber 6683, page 8. Gwendolyn Gwynne DeClairville to Nature Conservancy, Inc.

Appendix III

HYDROPOWER REFERENCES⁷⁶

Hydropower Equipment Manufacturers and Hardware Suppliers

Allis-Chalmers Fluid Products Co.
Hydro Turbine Division
Box 712
York, PA 17405
(717) 792-3511

Associated Electric Co., Inc.
54 Second Street
Chicopee, MA 01020
(413) 781-1053

Barber Water Power Products
P.O. Box 340, 100 Barrick Rd.
Port Colborne, Ontario
CANADA
(416) 834-9303

Bouvier Hydropower Inc.
12 Bayard Lane
Suffern, NY 10901
(914) 357-2840

Essex Turbine Co.
Kettle Cove Industrial Park
Magnolia, MA 01930
(617) 525-3523

Fairbanks Mill Contracting
North Danville Village
RFD 2, box 66
St. Johnsbury, VT 05819
(802) 748-8094

Flygt Corporation
129 Glove Avenue
Norwalk, CT 06856
(203) 846-2051

Canyor Industries
5346 Mosquito Lake Road
Deming, WA 98224
(206) 592-5552

Cornell Pump Co.
2323 SE Harvester Drive
Portland, OR 97222
(503) 653-0330

Hydro West Group, Inc.
1422 30th St., NE
Bellevue, WA 98004
(206) 455-0234

⁷⁶ The list of contacts is reproduced from information given to the author by the NY power authority, by Mr. Mark Kapner.

Hydro West of California, Inc.
P.O. Box 243
Alamo, CA 94307
(415) 820-8326

Kvaerner Hydro Power, Ire.
P.O. Box 7067
San Francisco, CA 9420
(415) 777-3800

Gilkes, Inc.
1902 Bayport Blvd.
Seabrook, TX 77586
(713) 474-7622

Vöest-Alpine International Corp.
439 Commerce Lane
Berlin, NJ 08009
(609) 768-0200

Bicycle
JG Press, Inc.
18 South 7th, Box 351
Emmaus, PA 18049
(215) 978-4135

Energy Source
DNRC
Lee Metcalf Building
1520 E. 6th Ave.
Helena, MT 59620
(406) 444-6697

Northeast Sun
Northeast Solar Energy Association
14 Green St.
P.O. Box 541
Brattleboro, VT 05301
(802) 254-2386

Ingersoll-Rand
P.O. BOX 486, 942 Mem. Pkwy.
Phillipsburg, NJ 08866
(201) 859-7853

Small Hydroelectric Systems and
Equipment
5141 Wickersham
Acme, WA 98220
(206) 595-2312

Hayward Tyler Pump Co.
P.O. Box 492
80 Industrial Parkway
Burlington, VT 05402
(802) 863-2351

Neyrpic Hydro Power, Inc.
969 High Ridge Road
Box 3834
Stamford, CT 06905
(203) 322-3887

Custom Builder
The Willow Publishing Group, Inc.
120 Wilton Rd.
Peterborough, NH 30458
(603) 924-9641

independent Power
Alternative Sources of Energy
107 S. Central Ave.
Milaca, MN 56353
(612) 983-6892

Technology Review
Massachusetts Institute of Technology
Room 10-40
M.I.T.
Cambridge, MA 02139

WSEO Dispatch
WSEO Dispatch
400 East Union
Olympia, WA 98504
(206)754-0700

Periodicals and Magazines That Report on hydropower

BioCycle
JG Press, Inc.
18 South 7th, Box 351
Emmaus, PA 18049
(215)-978-4135

Energy Engineering
700 Indian Trail
Lilburn, GA 30247
(404) 925-9388

Mother Earth News
P.O. Box 70
Hendersonville, NC 28793
(704)693-0211

Vita News
Volunteers in Technical Assistance
1815 n. Lynn St., Suite 100
Arlington, VA 22209

Currents
ID Dept. of Water Resources
Statehouse
Boise, ID 83730
(800) 334-7283

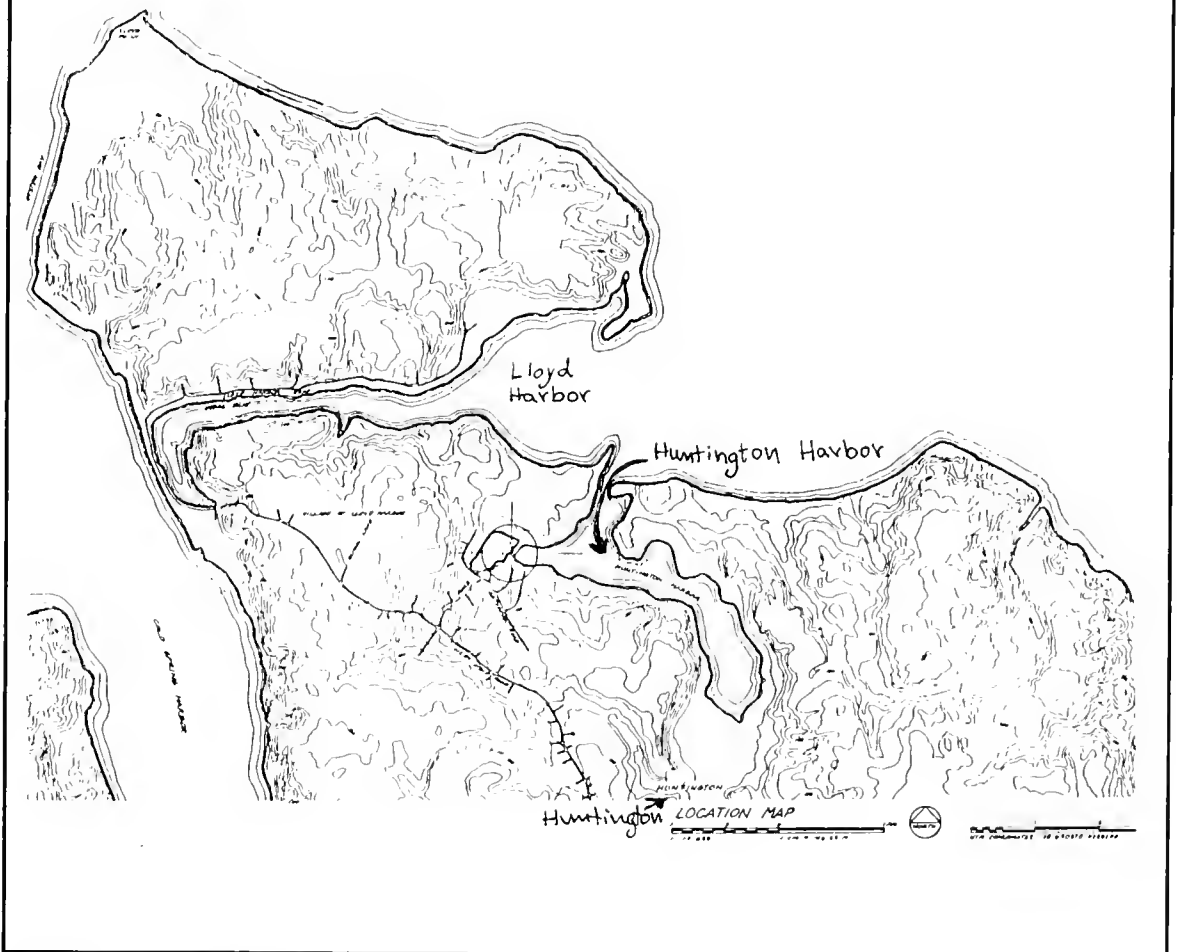
EPRI Journal
P.O. Box 10412
Palo Alto, CA 94303
(415) 855-2000

Popular Science
Times Mirror Magazines, Inc.
2 Park Ave.
New York, NY 10016
(212)779-5000

Appendix IV

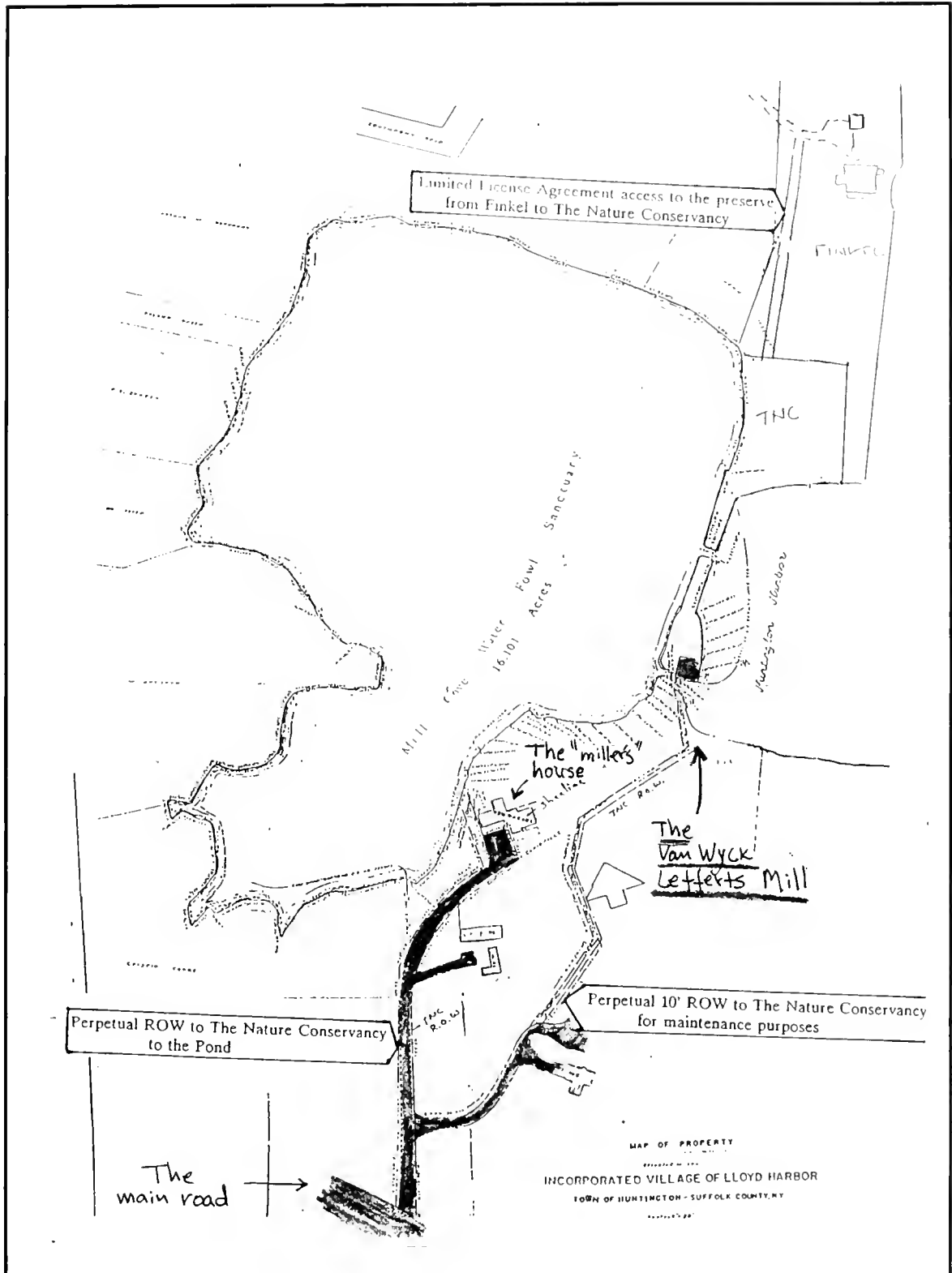
MILL DRAWINGS⁷⁷

THE VAN WYCK-LEFFERTS TIDE MILL
1793-1797



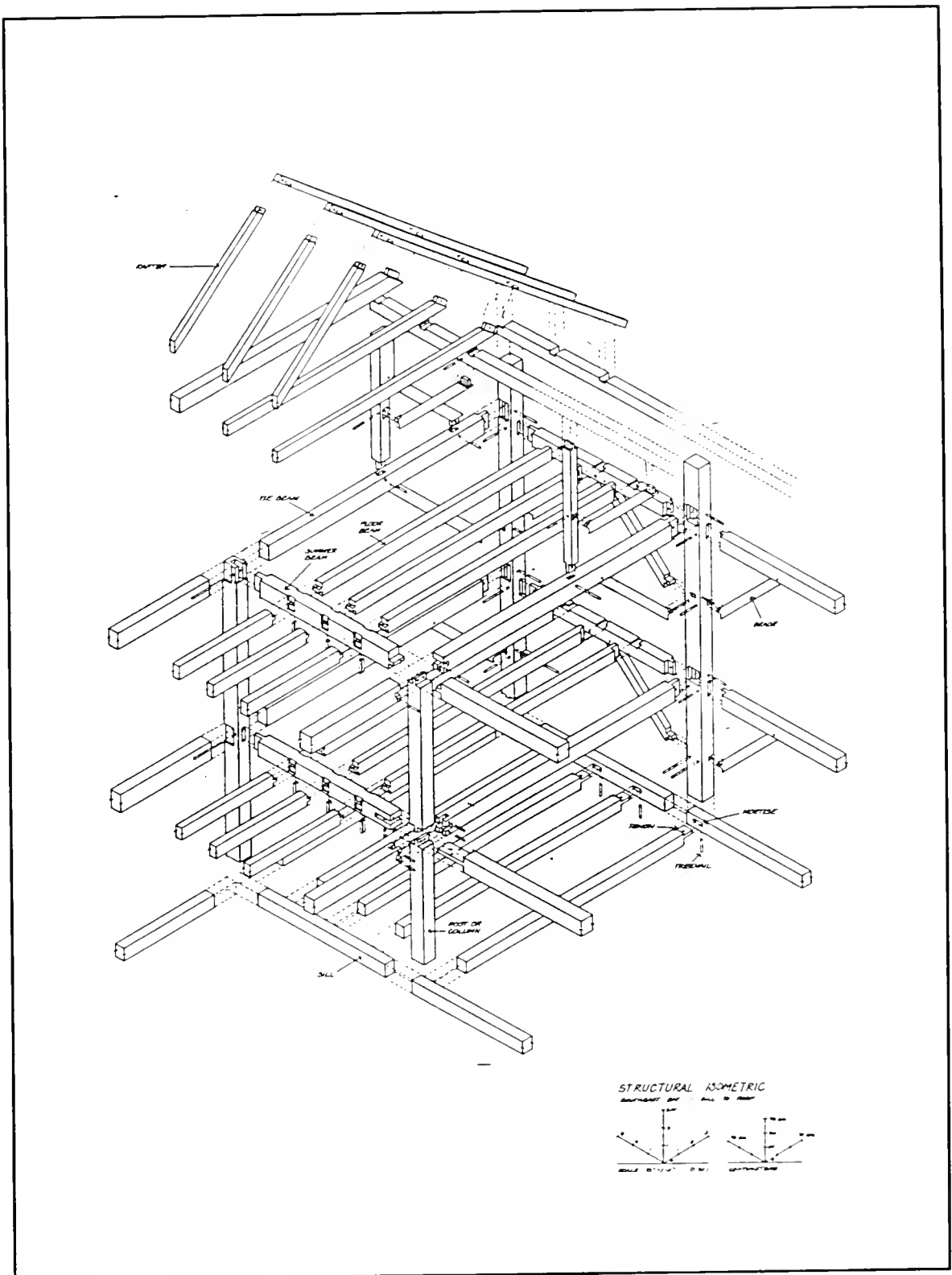
Drawing 1 Location Plan

⁷⁷ All drawings are from HAER

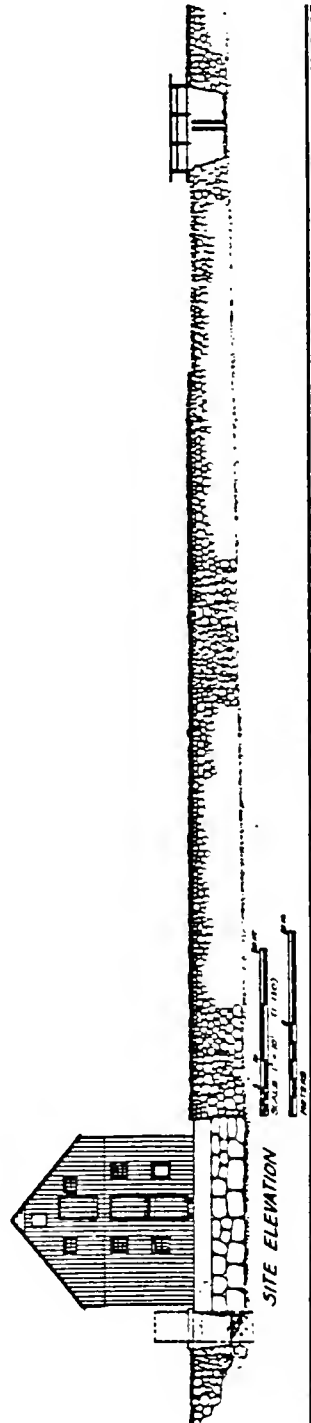


Drawing 2

Site Plan

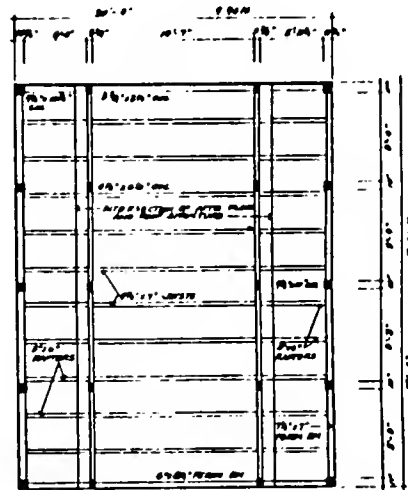
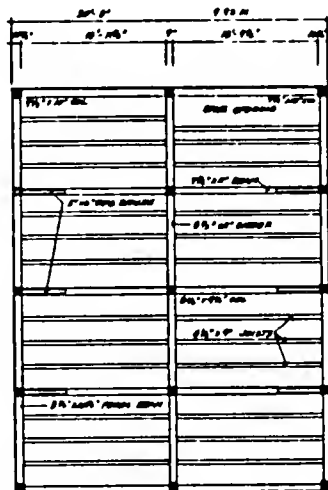
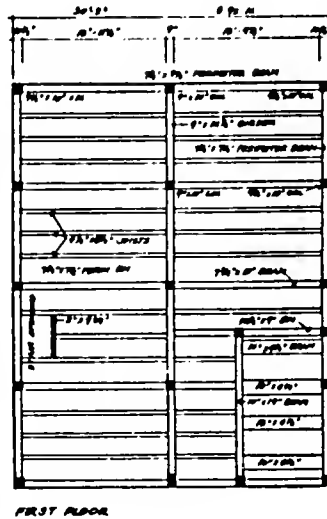
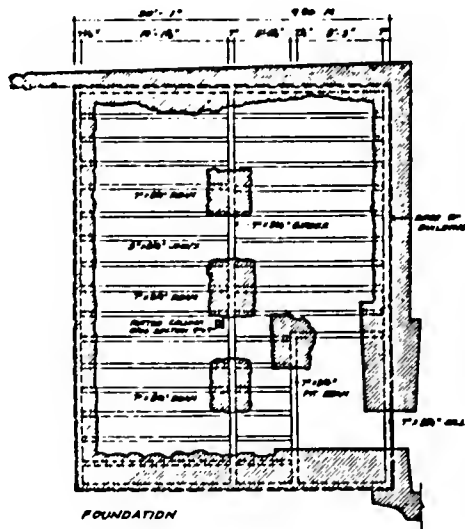


Drawing 3 Structural Isometric (HAER)



Drawing 4

Site Elevation

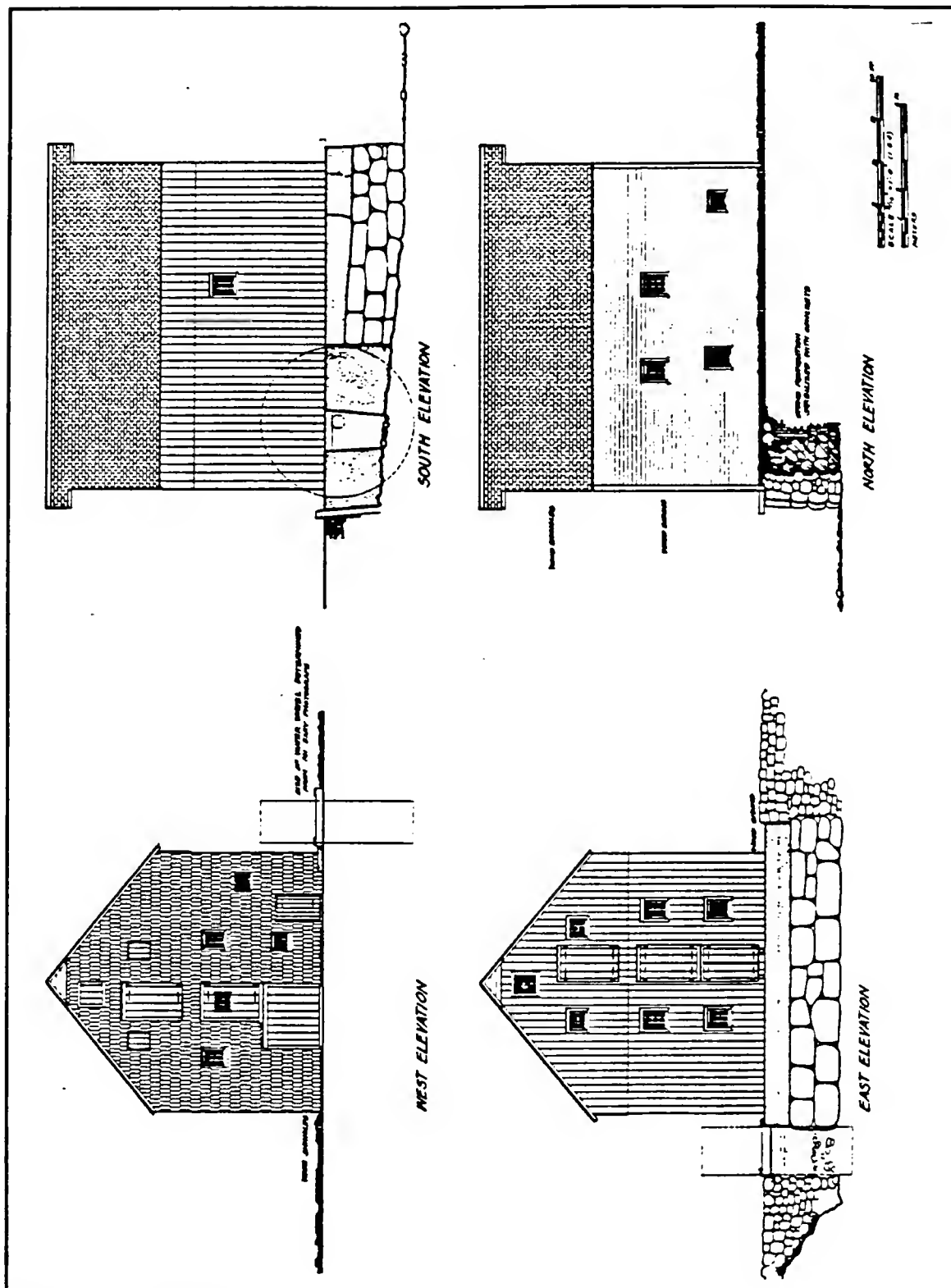


STRUCTURAL PLANS
(REFLECTED CEILING PLANS)

Scale: 1/4" = 1'-0" (1:48)

NOTES

Drawing 6 Structural Plans



Drawing 7 Elevations

Drawing 8 Sections

SELECTED BIBLIOGRAPHY

Books

- Compiled by Cornell, Jaray. *The Mills of Long Island Part I II*. Long Island NY: Ira J. Friedman, 1962.
- Dedrick, B. W. *Practical Milling*. Chicago: National Miller, 1924.
- Evans, Oliver. *The Young Mill-Wright & Miller's Guide*. Wallingford: Reprinted from the First Edition 1795, by Oliver Evans Press, 1990.
- Hopkins, Thurston R. *Old Watermills and Windmills*. London: The Camelot Press, n.d.
- Howell, Charles and Allan Keller. *The Mill at Philipsburg Manor Upper Mills and a Brief History of Milling*. Tarrytown, NY: Sleepy Hollow Restoration, 1977.
- Jackson, Bidsall. *Stories of Old Long Island*. Rockville Center NY: Paumanok Press, 1934.
- Moritz, L. A. *Grain-Mills and Flour in Classical Antiquity*. Oxford: The Clarendon Press, 1958.
- Overton, Jacqueline. *Long Island Story*. Long Island, NY: Ira J. Friedman, 1929.
- Ryan, Nathaniel A. *The Growth of Agriculture in Riverhead Town*. Suffolk County Historical Society, n.d.
- Storck, John and Walter Dorwin, Teague. *Flour for Man's Bread, A History Of Milling*. Minneapolis: University of Minnesota Press, 1952.
- Weiss, Harry B. and Robert Sim J. *The Early Grist And Flouring Mills Of New Jersey*. Trenton, New Jersey: New Jersey Agricultural Society, 1956.
- Freese, Stanley. *Windmills and Millwrighting*. Newton Abbot: David and Charles, 1971.
- Rawson, Marion N. *Little old mills*. E.P. Dutton & Co. Inc., 1935, n.p.

Research Papers

- Daniels, Christine M. "Lefferts Tide Mill (Van Wyck Mill) Long Island Survey." Historic American Engineering Record HAER No. NY-106, 1975.

Ryan, Richard. "Flour Milling Machinery and Operation At Saddle Rock Gristmill During The Mid 19th Century." Nassau County Department of Recreation and Parks, December 24, 1991.

"New Mill Restoration." The Suffolk County Planning Department, n.d.

Articles

Bleyer, Bill. "Grist Mill's Future Uncertain." *Long Island* (June 22, 1988).

Bleyer, Bill. "New Money for Old Landmarks." *Long Island* (September 29, 1992).

Cagney, Oakely W. "Long Island Long Ago, Lefferts Mill Harks Back To Old Times." *Long Island Press* (March 28, 1971).

Lott, E. Town Historian. "Huntington History, Coles Wortman, Master Builder." *Long Islander* (August 29, 1964).

Sass, John A. "The Versatile Millstone Workhorse of Many Industries." The Society for the Preservation of Old Mills, collection of articles from 1884-1990, (n.d).

Compiled and edited by Yeager Howell, Edna. "Around the Fork a collection of published articles." Interlaken, NY: I.T Publishing Corp., (n.d.).

"An Old Harbor Landmark." *The Long Islander* (February 28, 1969).

"Community Saves Historic Landmark." *Long Islander* (April 24, 1969).

"Windmills Get 'Historic' Listing." *NY Daily News* (February 1979).

"Our town remember." *Long Islander* (July 7, 1983).

Brochures

"Stony Brook Grist Mill." Stony Brook Community Fund.

"Stony Brook, Main Street on the Harbor, Long Island."

"The Saddle Rock Grist Mill." Nassau County Department of Recreation and Parks, Division of Museum Services.

"Hagley, Map and Visitors Guide." Hagley Museum and Library.

"Connetquot River State Park Preserve." New York State Office Of Parks, Recreation & Historic Preservation, Long Island State Park Region.

"The Mill On The Connetquot." New York State Office Of Parks, Recreation & Historic Preservation, Long Island State Park Region.

Other Sources of Information

Articles with no dates or name from newspapers, letters, and files from the library and archive of the Huntington Historical Society.

Interviews by the Author⁷⁸

Barns, Hap. Facilities Manager, Stony Brook Community Fund. Stony Brook Grist Mill, February 1994.

Hampton, Lori. Field Representative, The New York State Office of Parks, Recreation and Historic Preservation, Field Services Bureau, Long Island Region. Telephone interview, March 1994.

Hoffsteter, Loyd. Energy Technical Specialist II, NY State Energy Office. Telephone interview, March 1994.

Howard, Robert. Curator of Industry and Technology, Hagley Museum and Library. Hagley Museum, November 1993.

Hunt, Harrison. Division of Museum Services, Nassau County department of Recreation and Parks. Saddle Rock Grist Mill, October 1993 & February 1994. Roslyn Mill, February 1994.

Kapner, Mark. Manager of Conservation and Alternative Energy, NY Power Authority. Telephone interview, March 1994.

Kennett, Christopher. Ph.D. in Behavioral Evolutionary Ecology from Fordham University. October 1993.

Knapp Eleanor. Manager of Education and Museum Operation, Hagley Museum and Library. Hagley Museum, November 1993.

Lowton, Gary. Conservation Educator, Connetquot River State Park, NY State Office Of Parks, Recreation and Historic Preservation, Long Island State Park Region. Connetquot River Park, The Mill On The Connetquot, March 1994.

Lund, Bruce. Director of Preserves, The Nature Conservancy, Long Island Chapter. Nature Conservancy, February 1994.

Mallano, Glance. Director of Historic Services, Suffolk County Department of Park, Recreation and Conservation. Blydenburgh Park, New Mill, March 1994.

⁷⁸ See Appendix..... for list of titles, addresses and phone numbers.

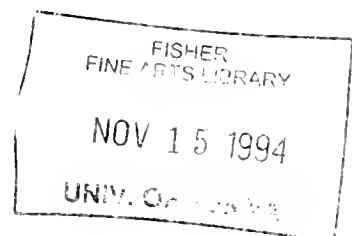
Studenroth Zachary N. Director of the Huntington Historical Society. Several interviews since August 1993 at Huntington Historical Society or at the Van Wyck Lefferts Tide Mill.

Anne & Jerome Fisher

FINE ARTS LIBRARY

University of Pennsylvania

Please return this book as soon as you have finished with it. It must be returned by the latest date stamped below.



3 1198 04975 4216



N/1198/04975/4216X

3 1198 04975 4216



N/1198/04975/4216X

Vertical text on the right edge of the page, likely a page number or identifier, partially obscured by a white strip.